THE IRON TRADE REVIEW

A JOURNAL OF THE IRON, STEEL, MANUFACTURING AND TRANSPORTATION INTERESTS OF THE CENTRAL WEST.

VOLUME XXI. CLEVELAND, O., SEPTEMBER 27, 1888. NUMBER 40.

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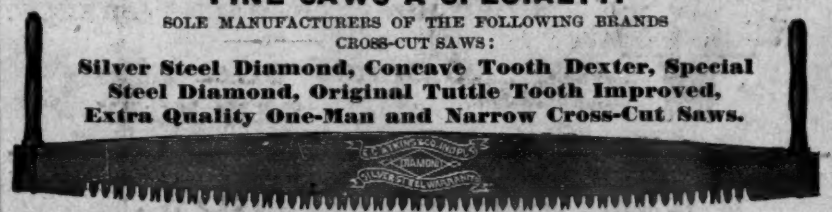

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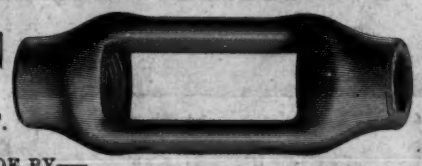

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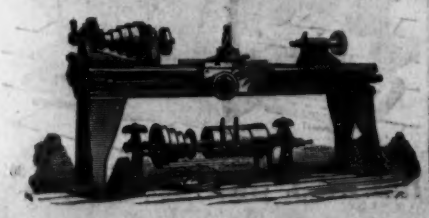

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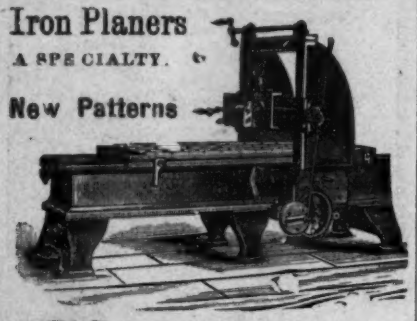

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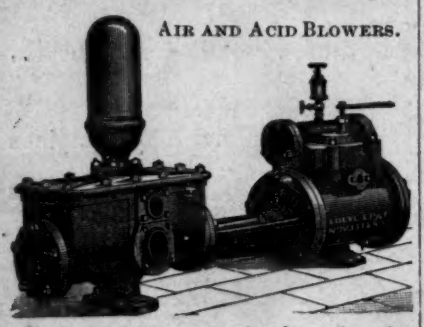

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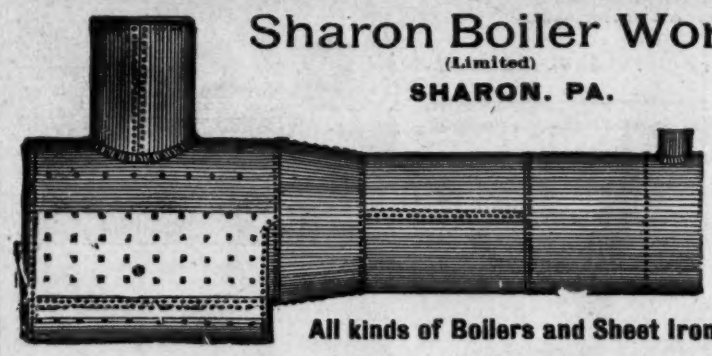

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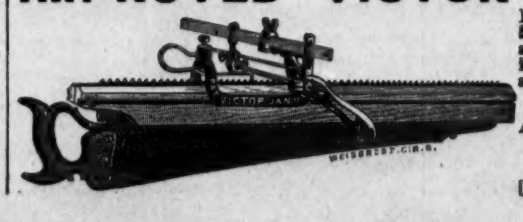

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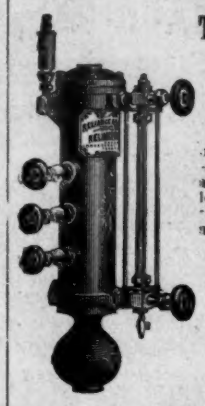

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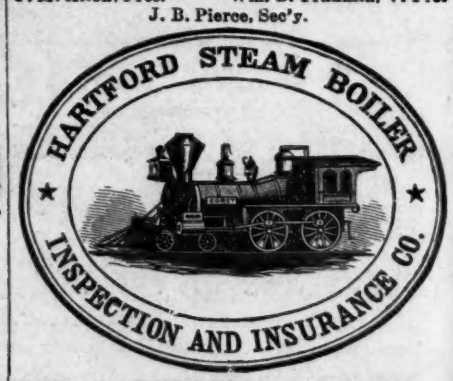

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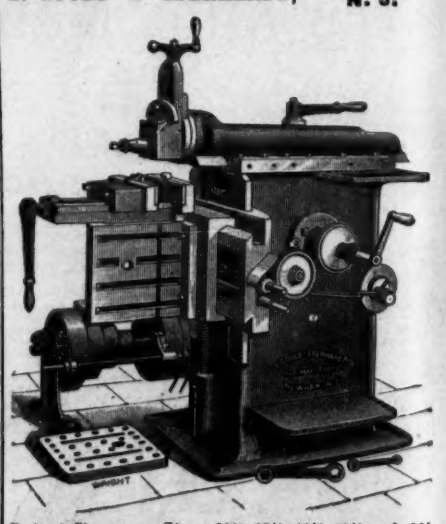

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VOLUME XXI. CLEVELAND, O., SEPTEMBER 27, 1888. NUMBER 40.

TESTING A BRIDGE MODEL.

A recent number of the *Genie Civil* reprints from the *Australasian* an interesting account of testing an iron bridge to destruction. The safety of the viaduct at Moorabool (India) being questioned, a model of one of the spans was constructed upon a quarter scale, and tested in the railroad shops, where it was placed beneath a shaft arranged to subject it at each revolution to a pressure equivalent to that of a train weighing forty-four tons; the dead weight of the span was forty-three tons.

The revolutions of the shaft were automatically recorded, and after 1,000,000 applications of the load, no permanent deformation of the model was visible. The live load was increased one-fourth, and a slight deformation was apparent after another million applications. The live load was again increased a fourth, and a million more applications increased the deformation somewhat. The live load was finally doubled, and produced rupture after 18,000 applications. It was concluded from these experiments that the life of the viaduct, under its maximum traffic, would be at least 150 years.

The engineer making the 160-year prediction should imitate the Hibernian, who, asserting that elephants lived 1,000 years, proposed to buy one and verify it.

The experiments appear to be unique, and might be valuable if the data was accompanied with details of construction, dimensions and operations. There is a great discrepancy between the ratio of the given weights of dead and live loads and those of usual practice, and the amount of final breaking load is not clear.

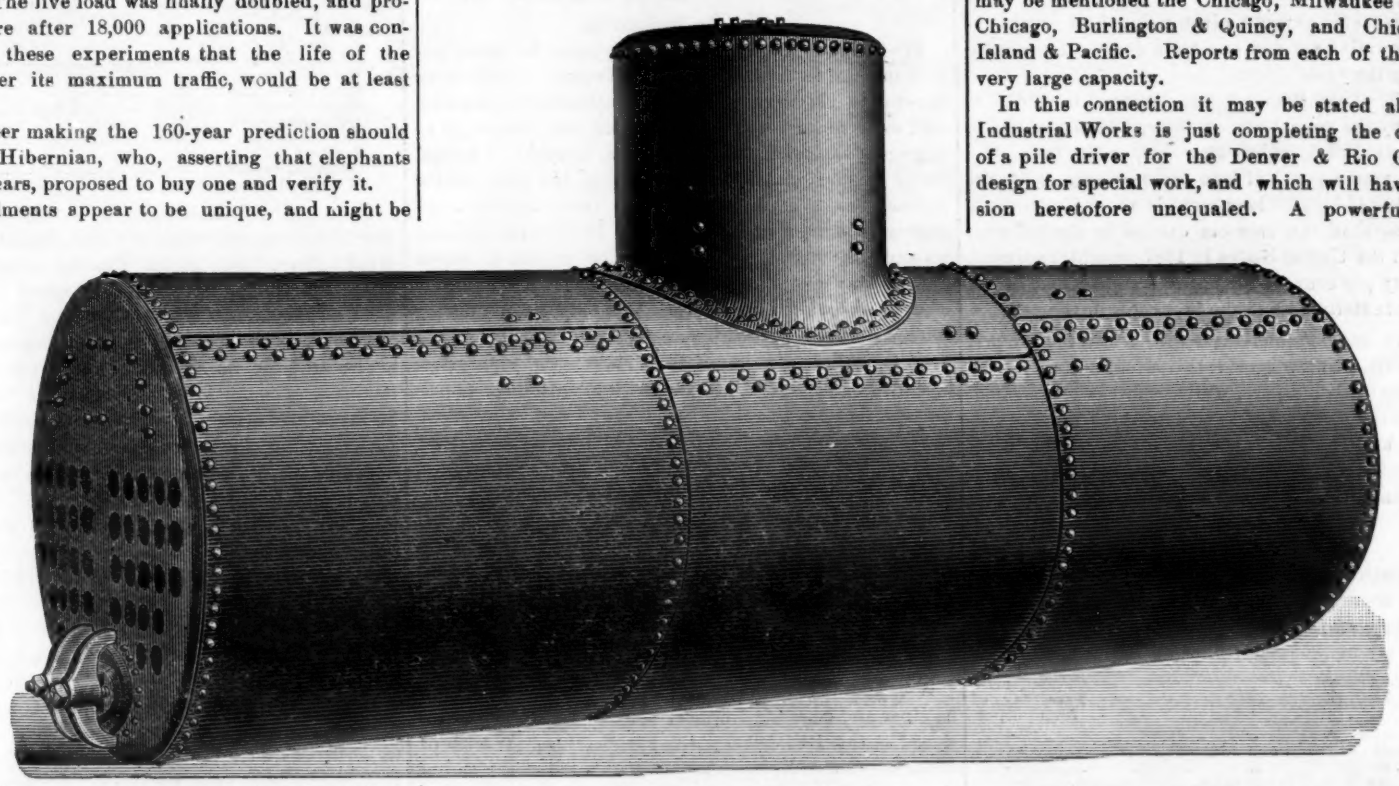
There is in the College of Civil Engineering at Cornell University an iron Pratt truss through bridge about twenty feet long, built to the scale of one-tenth from railroad bridge drawings, by the Athens (Pa.) Bridge Shops; also a model on a somewhat smaller scale, in wood, of an oblique, cut-stone arch; but we do not know that these or any other large models in this country have ever been carefully tested.

A Portable Steam Heater.

A Bridgeport (Conn.) man has invented a neat thing in the way of a steam heater to carry about on the person. It is a small affair, consisting of a copper boiler, under which is a diminutive lamp, all encased in a nickel box, and balanced something like a compass, so that, no matter what position the outside box is in, the boiler and lamp will always remain in the required vertical position. The entire apparatus is so small that it can be carried in the pocket. After the lamp is lighted, the water in the boiler is heated and circulated through rubber tubes, which run down the legs, around the ankles, up around the back and back to the boiler. The circulation of the water keeps the body warm on the coldest day. A safety valve and escape for a higher pressure of steam than the affair is allowed to carry flows off at the back of the wearer's neck. Elaborate heaters are being constructed for ladies wear. They can be worn inside the bustle, and entirely obscured. Before going out of the house the lady's maid can light the lamp, which, by the way, is gauged to run six, eight or ten hours.

THE FULTON BOILER WORKS.

The Fulton Boiler Works, John T. Caulfield, proprietor, Richmond, Ind., have been run by Mr. Caulfield about four years, and during that time the business has grown steadily. His trade now extending all over the country. He makes a specialty of iron and steel boilers, also smoke stacks, tanks, pans and breechings. The illustration shows one of his tubular boilers, in which he has a large trade. He employs a large force of workmen the year round, and is prompt in filling orders as rapidly as they come in.



Beginning of Iron-Making in New Jersey.

The first iron made in New Jersey was at a place just south of Trenton, from the limonite or bog ore that abounds in that section, and the first forgemaster was Governor Lewis Morris, who came to Monmouth from Barbadoes before the year 1680. When the revolution came on the iron men had grown skillful enough to make cannon and shells for the Continentals; also big shallow pans in which to evaporate sea water and supply salt when the foreign article was cut off.—[Chicago Herald.

Shipbuilding on the Delaware.

Delaware river shipbuilders, according to the Philadelphia *Telegraph*, are looking forward to a very active and prosperous season. Contracts already placed or to be shortly entered into will provide for an expenditure of $3,000,000 in the section mentioned. The various firms are increasing their plants in anticipation of a continued period of prosperity. The work to be done is to be confined almost exclusively to vessels to be employed in the coast, West India and Australian trade.

SAWING STEEL RAILS.

The Michigan Central Railroad has for some time past, in connection with its track work, been operating a portable steel rail saw which was designed and built for them by the Industrial Works, of Bay City, Mich. This device consists of a massive iron car, carrying a cutting off saw, rail drills, hydraulic press for straightening, as well as the necessary attachments for handling rails, and the boiler and engine which supply power.

Much remarkable work in cutting off the ends of battered rails has been done with this machine, but the maximum yet reached was a recent accomplishment. On September 12, Mr. J. B. Morford, superintendent of the Canadian Southern division, telegraphed the Industrial Works as follows: "We have beaten the record with our rail saw, having cut and drilled (both ends) 372 rails in 10 hours' service on Tuesday, the 11th inst." Among other roads who are using similar appliances may be mentioned the Chicago, Milwaukee & St. Paul; Chicago, Burlington & Quincy, and Chicago, Rock Island & Pacific. Reports from each of these indicate very large capacity.

In this connection it may be stated also that the Industrial Works is just completing the construction of a pile driver for the Denver & Rio Grande, of a design for special work, and which will have an extension heretofore unequaled. A powerful wrecking crane, also of special design, is just approaching completion in their shops for the New York, Lake Erie & Western road. It is built entirely of iron and steel, and presents a very massive appearance.

Why a Rolling Mill Project Failed.

Lloyd, Booth & Co. have purchased the machinery of the proposed rolling mill partly erected at Bowling Green and will bring it here and scrap it The mill was to have been erected by parties and others interested in the rolling mill at Portsmouth, part of which was to be used at Bowling Green. The citizens of Bowling Green offered a bonus if the mill was ready to turn out iron at a certain time. Part of the buildings were erected and the machinery in the ground when a storm blew the structure down. It was raised again, and one of the guy ropes fastened to a car. In switching a train the guy rope was loosened and a portion of the buildings were thrown down. This discouraged those interested and the project fell through, as it could not be completed in time to secure the bonus. The plant was recently sold at sheriff's sale and purchased by Lloyd, Booth & Co.—[Youngstown (O.) Telegram]

ELECTRIC motors are to be used on the underground railway of London.

OUR IRON ORE TONNAGE.

In a valuable paper read before the Franklin Institute, by Mr. John Birkinbine, and recently revised, we take the following:

The mining of iron is a business of considerable importance, and to appreciate its volume we may estimate the railroad traffic which it represents, although all of the ore does not pass over railroads and much of it reaches the blast furnaces by both rail and water transportation. The majority of the ores from the Lake Superior region are carried by rail to shipping ports, thence by vessel to the lower lake ports, and there rehandled into cars which travel over the railroads to the blast furnaces. Several blast furnace plants are located so as to unload foreign ores at their docks, but most of the foreign ore is transported from the ports where received by railroad cars or by lighters to the points of consumption. A number of our iron works also rely largely on the local deposits, from which the ore is carried by wagons or carts or by wire-rope transmission or by tramroad to the furnaces. The proportion, however, of ore which is not hauled over our systems of railroads is quite small, and an illustration of the volume of business based upon the tonnage is a proper one.

Allowing an average load of fifteen net tons per car, which is more probably above than below the actual average, the amount of ore consumed in 1887, viz: 13,063,439 long tons or 14,631,052 net tons, would require 975,404 cars to carry it, or say 32,514 trains of thirty cars each, five such trains, with motive-power and caboose would occupy one mile of track when standing close together, or the year's product would occupy 6,503 miles of track, a distance equal twice that from New York to San Francisco.

If all this traffic passed a given point there would be eighty-nine trains per day or a train every sixteen minutes during the year.

The traffic of the Pennsylvania Railroad in 1887, as exhibited by the annual report, shows a total tonnage of through freight of 6,278,628 long tons, or less than one-half of the total amount of iron ore as above, and the local freight (43,754,669 long tons) is about three times as great, so that the iron ore carried by the different railroads in the United States in 1887 would represent nearly thirty per cent. of the entire freight traffic of the Pennsylvania Railroad and the branches for the year.

If now we estimate the labor required to mine the ore, load it on cars, and transport it to destination, we see the importance of this industry, which employs over 50,000 men. But the mechanical appliances used are features of interest, and the hoisting engines, pumps, air compressors, rock-drills, washers and jigs, connected with our mines have greatly influenced the advance in mechanical skill which has marked the development of our country.

The tabulated figures presented in this paper indicate the sources from which much of the iron ore is obtained, and from these figures we find that, of the estimated output of iron ore in 1887, the following approximate percentage came from

	Percentage of total output.
Lake Superior Region	37—
Foreign ores	9
Alabama, estimated	6—
Cornwall Ore Hills, Pennsylvania	5
Lake Champlain District	6
Tennessee, estimated	5—
Ohio	3
New Jersey	4
Virginia	4½
Missouri	3½
Salisbury Region	1—
Georgia, estimated	1—

From these figures an approximate estimate of the value represented by the iron ore shipment of any one source of supply can be made. As the ores vary in the yield of iron, it will be of interest to place them in something near their relative rank by estimating the probable percentage of the total amount of pig iron which these ores produced.

	Per cent.
Lake Superior ores	44
Foreign ores	10½
Lake Champlain ores	6½
Cornwall ores	5—
Alabama ores	5—
New Jersey ores	4½
Tennessee ores	4
Missouri ores	3½
Virginia ores	3—
Ohio ores	2½
Salisbury Region	1—
Georgia ores	½—

The strikes in the anthracite coal regions and in the coke regions during the year, materially reduced the demand for ores, and curtailed the output of some of the important Eastern districts, such as Lake Champlain, Cornwall and New Jersey mines.

The bulk of the hematites of Pennsylvania, of which we still have large deposits, are but little inferior in the yield of iron, and many are otherwise superior to the Southern ores, and our magnetites and those near us in New Jersey, together with the facility of drawing upon the Lake Superior and foreign countries for their best ores, place Pennsylvania in position to hold her status, and the question of the Keystone State maintaining its pre-eminence as an iron producer, rests entirely with those who manage and control its furnaces.

Gas For Locomotives.

Philadelphia Record.

The problem of obtaining a cheaper fuel than coal for locomotives, which has long bothered railroad men, seems likely to be solved soon by experiments now being made with gas. A very good test of the new fuel has been made at the works of the electric light company in West Chester, which, since the fire that destroyed the old plant several months ago, have been dependent for their motive power upon the Shaw locomotive. This is the engine that made such a good record in some trial trips two or three years ago, but which has never done much road service.

Instead of coal, gas mixed with air has been used in the locomotive with entire success in generating sufficient power to drive the dynamos. With larger machines for producing and mixing the gas, it is believed that power enough can be obtained for driving locomotives with trains, and a special car is now being built at New York to hold a large machine of the kind used in mixing the gas and the storage receivers. This will be attached to a locomotive, and tests will be made soon, probably on the main line of the Pennsylvania Railroad or the short branch line from West Chester to Phœnixville.

Japanese Industries.

The progress of industrial enterprise in Japan was very marked in 1887. In Tokio, Osaka, and Kioto no fewer than 111 large companies, industrial or commercial, were formed in the course of the year, with an aggregate capital of $21,500,000, not to speak of a number of smaller undertakings. During the same period thirteen banks made additions to their capital to the aggregate amount of $18,000,000. If to these amounts we add $32,000,000, representing the capital of eleven new railway companies, it appears that more than $71,000,000 were taken up by the Japanese people during 1887, the total representing an average of nearly $2 per head for the entire population. The new enterprises undertaken last year include cotton spinning, paper-making, dyeing, glass-blowing, tea and silk exportation, engineering, and the manufacture of porcelain, lacquer, bronzes, and other art objects, as well as of bricks, fans, machinery, ice, &c. The growth of cotton manufactories is, perhaps, the most significant sign of the times. At the close of December, 1887, there were no fewer than twenty-two spinning mills at work, representing 76,000 spindles and a yearly output of 1,320,000 lb., while eight new factories had been projected.

A Naphtha Refuse Burning Furnace.

A naphtha refuse burning furnace, acting both as a calciner and smelting furnace, has recently been introduced at the Redabeksky Copper Smelting Works of Messrs. Siemens Bros. The ore is charged at the end of the flue near the chimney, and gradually raked down against the flame, and thus calcined. It is then drawn, and the smelting charge made up to contain: Calcined ore, 3611·30 pounds: acid slag from previous process, 15 to 30 per cent; iron ore, 5 to 10 per cent; limestone, 5 per cent. About 5,400 pounds of this mixture are introduced in the furnace and melted down in three hours when about half as much as the first charge is added, and so on for every thirty or forty minutes, until the hearth is full. The regulus is tapped off twice a day. This furnace, in a thirty-three day's run, smelted 2,086,911 pounds of seven per cent. ore, consuming 408,835 pounds of naphtha refuse, at $10.52 per ton, and yielded 810,737 pounds of regulus, containing 35 per cent. of copper; or to produce 2,000 pounds of regulus required 1,008 pounds of refuse, costing $5.32. This is said to work 3·5 times faster than the ordinary ore furnace, and at the above works to be cheaper than when wood is used.

CAPT. MCCLELLAN, inspector of boilers for the city of St. Louis, has issued an invitation to the boiler inspectors of other cities throughout the country to join in organizing a national convention of boiler inspectors, for the purpose of exchanging views as to the best method of inspection for the better protection of life and property.

SLAG WOOL.

The Engineer (London).

At the last meeting of the London Association of Foremen Engineers and Draughtsmen a paper was read by Mr. Fred. M. H. Jones, on "Silicate Cotton, or Slag Wool; its nature and various uses as an imperishable non-conductor of heat, cold, and sound."

Mr. Jones stated that silicate cotton, or slag wool, was a mineral fibre produced from blast furnace slag, and is made by driving jets of steam through the molten slag as it runs from the furnace, thus drawing it out into thin glass-like threads. He showed specimens of ordinary slag, untreated by this process, and also of the slag wool, both in its raw state as produced, and also as prepared in various forms and thicknesses for a cover for boilers, pipes, walls, etc. He stated that there were three different makes of this material. The first was originally produced in Germany, at the furnaces of Herr Krupp, of Essen; but, from the soft nature of the German slag, the German-made slag wool is of very poor quality, and is liable to go to powder with the slightest pressure or vibration. There is another make of this material produced in the United States somewhat similar, but rather better, and in America it is very largely used under the name of "mineral wool." The particular make of silicate cotton, or slag wool, however, to which he drew special attention was the British-made material, which, though more difficult and more expensive to produce than the other makes, possesses certain qualities which make it incomparably superior to them. Mr. Jones explained why slag wool was such a good non-conductor, and mentioned some experiments which had been carried out to test it in comparison with other materials, and quoted the following table, showing the relative conducting powers of heat of various boiler-covering materials:

Silicate cotton or mineral wool	100
Hair felt	117
Cotton wool	122
Sheep's wool	136
Infusorial earth	136
Charcoal	140
Sawdust	163
Gasworks breeze	230
Wood and air space	280

He stated that the material was very largely used by the Admiralty, and engineers and shipbuilders, for covering boilers, steam pipes, etc., and that it was particularly adapted for uptakes, etc., where forced draughts were employed, and that the Midland Railway Company have about 2,000 locomotive boilers covered with it. It is also used for lining refrigerating chambers and protecting cold-water pipes and cisterns from frost; and he mentioned a test which was made by Mr. T. B. Lightfoot, C. E., in April, 1885, in which blocks of ice, each weighing 30 lbs., were put in separate boxes, one being surrounded by 2-in. of slag wool, and the other with 6-in. of charcoal. After three days the boxes were opened, when the block in the case surrounded by the slag wool was found to be reduced to 13 lbs., and the one in the case protected with the charcoal was reduced to 5½ lbs., thus proving that 2-in. of slag wool is a much better non-conductor than 6-in. of charcoal. Slag wool is now also largely used in buildings for deadening sound in floors and party walls, and for fire-proofing floors, walls, joists, girders, pillars etc., and is found to be especially effective in protecting joists and girders. It is also largely used for lining the roofs and the sides of corrugated buildings in climates where extremes of heat or cold are experienced, and where it is found of immense value in protecting them against sun in Summer and frost in Winter, as well as deadening the incessant noise caused by rain and hail in the wet seasons. A minor but material point in its favor for such purposes is the fact that it does not harbor any germs of insect life, and is altogether free from the attacks of the white ant or any kind of vermin. It has also recently been found that if the fire grates are stuffed at the back and sides with silicate cotton or slag wool the heat thrown forward is increased.

To Illustrate a Steam Boiler Explosion.

The force of steam boiler explosions can be illustrated by getting a tube made by a tinsmith, say half an inch in diameter, and closed at one end. Put a piece of ice the size of a cherry, or half a teaspoonful of water, into the tube and cork the open end tightly. Suspend the tube over a flame so that the ice melts and is converted into steam. The cork will be forced out with a loud explosion. Candle bombs held over a flame will explode in a similar manner. Water will produce 1,700 times its volume of steam.—[Allentown National Educator.

ADVERTISE in the IRON TRADE REVIEW.

STEEL RAILS, THE RAILROADS, AND THE PEOPLE.

In a recent *brochure* on the above subject, Mr. Cyrus Elder makes the following telling points:

An examination of the present state of the steel-rail trade will show that the productive capacity of the rail mills of this country is in excess of all probable requirements for rails. There is, therefore, no necessity for importing English rails, and any English rails which may be imported will simply cripple to that extent the American manufacture. It is not pretended that the present price of steel rails is too high, or that it affords undue profit to the makers. In fact, the slightest inquiry would show that the present price is too low; that it does not even afford cost upon a basis of rates of transportation and wages during the year 1887. Even with the reduction of wages which have been made, a number of the works have chosen to shut down rather than

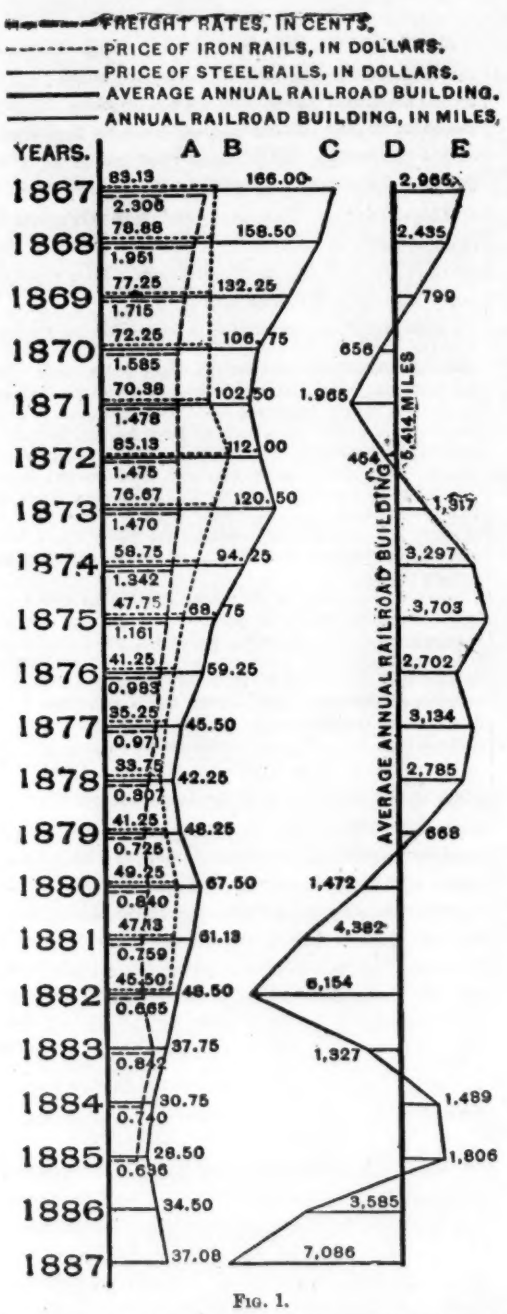


FIG. 1.

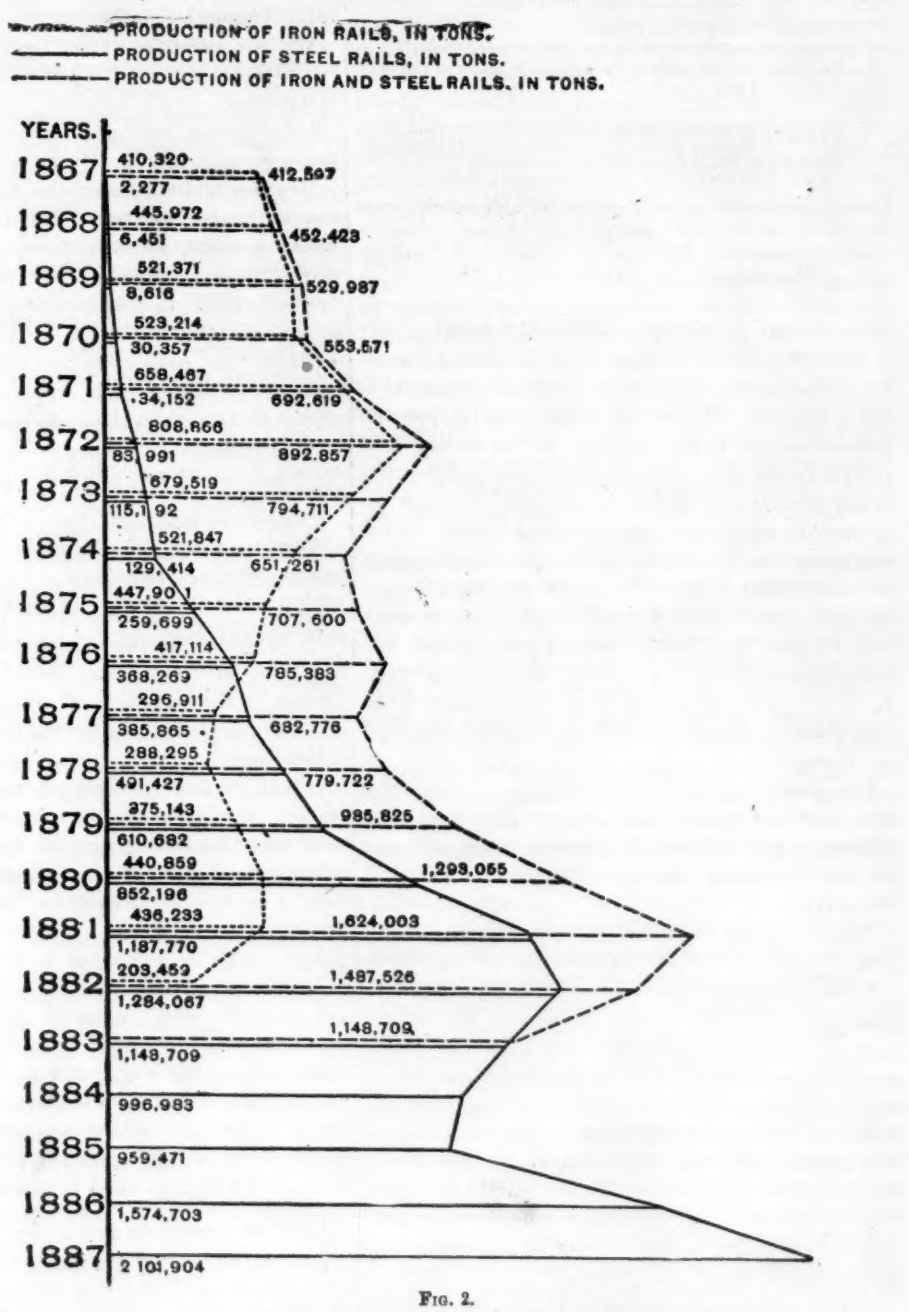


FIG. 2.

subject themselves to losses in accepting current prices. What is involved in the closing of rail mills may be imagined when it is considered that any one of the great establishments engaged in the production of steel rails employs a capital of from five to ten millions of dollars, most of which is invested in machinery, buildings, etc., and directly employs from three to ten thousand workmen. The dead-weight of interest and taxes, and the expenses of organization, which can not be wholly suspended during a temporary cessation of business, tend to make a cessation more disastrous than the continuance of operations even at considerable loss. * * * *

There is no other interest outside of the manufacture of steel rails which has such a concern in the prosperity of rail makers as the railroads themselves. To cripple the rail makers is to cripple the business of the principal trunk lines. The relations between the railroad companies, the makers of rails, and the public are exhibited in Fig. 1 in which the movement in freight rates, prices of iron rails, prices of steel rails, and actual mileage of railroad building are shown from the year 1867, when the first American steel rails were put upon the market, down to 1887. The basis of this graphic exhibit is the first perpendicular left-hand column of freight rates, prepared and published by Edward Atkinson, to include the year 1885. This column is marked A on the diagram. The line marked B shows the corresponding movement of prices in iron rails, C shows the corresponding movement in prices of steel rails, the perpendicular line D, indicates the average annual increase of railroad mileage, while the line E, indicates the years and the extent to which railroad building exceeded the average or fell short of it. Fig. 2 shows the relative production of iron and steel rails for the same period of twenty-one years.

These tables exhibit in one comparative view the actual facts in regard to these important matters, and some general deductions of value may be drawn from them. There are disclosed three marked waves of railroad construction, culminating respectively in the years 1871, 1882 and 1887. In the first period, extending from 1867 to 1871, the construction was with iron rails, except to an inconsiderable portion, the prices of which declined during this period of five years in the inconsiderable annual proportion of about $2.50 per ton, while steel rails declined from $166 to $102.50 per ton. During the next period of ebb and flow of the wave of railroad construction, extending from 1871 to 1882, an examination of these lines of prices, railroad construction and freight rates will show that there is no well defined relation or dependence from year to year between the prices of rails and the building of railroads and rates of transportation. There are, indeed, anomalies, such as the fact that regular and long continued shrinkage in prices for rails prevailing year after year for a period of five years, from 1873 to 1878, did not induce railroad building, but that its tide remained at the ebb. Nor does it appear that the prices of rails have been a controlling factor year after year in fixing freight rates charged by the railroad companies. While this is the case, the general tendency of convergence in the lines of cost of transportation and the price of rails has its significance. Railroad companies paid largely more for rails in 1872 than they did in 1871, and in 1873 than they did in 1871, but they were unable to charge higher rates of freight for this reason. With the price ruling in 1880, at $67.50 for steel rails, and $49.25 for iron rails, the freight rate was materially less than in the year 1877, when steel rails were sold at $45.50 and iron rails at $35.25. In 1883, with steel rails ruling $4.50 lower in price than ever before, and with low prices for rails in the previous year, the railroad companies were able to exact a freight rate very much higher than they had received during the five previous years, in one of which the price of rails was materially higher than it had been during the seven years previous to 1883. It is evident from this analysis and such further contrasts as may be easily made that the railroad companies have not increased freights because they were obliged to pay high prices for rails, or reduced freight rates because they were able to get cheap rails. Where these movements or results concur it has evidently been from some other cause.

A Well Known Iron Man Dead.

Gen. Cartherinus P. Buckingham, president of the Chicago Steel Works, of Chicago, died at his residence in that city on August 30th, after a brief illness. He was born in 1808 at a small village called Springfield, near Zanesville, in Muskingum county, Ohio. In 1873 he and his brothers established the Chicago Steel Works, which have been successfully operated by them from that time until the present. These works are among the few mills in the country making a specialty of manipulating old steel rails and putting them into merchantable shapes, for which they use machinery of original and very ingenious design.

AT Salvador they make umbrellas, carpets, beds, bridle reins, lariats and ropes from the fibre of the banana tree.

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CLEVELAND, O., SEPTEMBER 27, 1888.

GOOD NEWS FOR WORKINGMEN.

Edward Atkinson was some years ago elected a member of the Cobden Club, and if we are not mistaken, is still a member. We do not know what his political predilections are in this campaign, but we do know, as everybody else does, his carefulness and thoroughness in any investigation undertaken by him, and that his figures may be accepted, as absolutely accurate. In the September number of the *Forum*, he contributed an article entitled "Progress from Poverty," which is one the most important additions to statistical information that we had for a long time, and gives comfort and encouragement to those who believe that the great working masses of the United States stand on a higher plane than elsewhere, and are making steady progress upward and forward.

The conclusions reached, effectually contradict the wild and unsupported statements frequently made by ignorant and mendacious Congressmen and speakers on the stump, more intent upon misleading than informing.

Recognizing the difficulty of making proper comparisons, though the medium of a currency having widely different values at different times, Mr. Atkinson, after patient investigation of the census reports and returns made by himself to cover the years since the census yesr 1880, establishes a multiple standard consisting of equal quantities of the same kinds of food, fuel and materials for clothing, corresponding to the average daily consumption of an adult workman in the Eastern or Middle States, and by means of this, establishes a basis "for the comparison of the relative conditions of workmen and capitalists in this country at different dates during the last twenty-five years."

In view of the public statements so frequently made in the papers and in speeches, the following extract is significant:

"In making selections for the comparison of wages by the use of the multiple standard, I have selected arts or occupations which have been in substantially contiuous operation during the whole period under consideration, that is, subject to very few stops or none. I am aware that the adverse comment on this method will be that during this period, since 1860, there has been greater variation in the supply and demand than at any previous dates or periods of economic history. Such stupendous changes could not have occurred in a single generation without giving some support to this criticism. Space will not permit me to treat this branch of the subject; suffice it to say that my own observations has led me to the conclusion that in each period of commercial panic, namely, 1866-1873, and for a few years of alleged depression, subsequent thereto, as well as in the recent period of alleged depression, from 1881 to 1886, the number of the unemployed has been very much exaggerated. In my judgment, compulsory idleness has hardly existed at all, except in connection with the alternate periods of cessation and of great activity in the construction of railroads, and has mainly affected the workmen employed on that branch of industry, reaching, of course, in a limited measure, upon others. It may also be apparent, from the data I have submitted, that this period of steady reduction in prices since the end of the civil war *has been in fact a period of the greatest progress in material welfare ever witnessed in this or any other country. The temporary difficulties, local distress and congestion of labor, limited mainly to some of our great cities, have been mere incidents in the adjustment of society to new conditions of an assured abundance, such as were never before achieved.*" (The italics are ours.)

It is impossible in this article to go into details—we can only give the conclusions reached by Mr. Atkinson. He aggregates his working men into four different classes:

I. Especially skilled men—foremen, overseers, etc.

II. Average mechanics.

III. All operatives, except foremen and overseers, in 100 establishments, each reporting the wages of from 20 to 2,000 men.

IV. Laborers computed separately, connected with above works.

He gives tables showing the steady advance in the wages of each class, from 1860, the close of the Low Revenue period, to 1885, during the High Revenue period, but satisfactory as this is, it is the least significant statement. In consequence of the numerous inventions, the introduction of valuable machinery and methods, "the GAIN in the purchasing power of wages, measured by the multiple standard of food, fuel and cloth, has been from 1860, as compared to 1885 and 1886, as follows:

Class I	70 per cent.	Class III	40 per cent
Class II	59 per cent.	Class IV	43 per cent

The gain in 1885 and 1886, as compared to the year 1865, when paper money and war had exerted their utmost effect, was, as follows:

Class I	08 per cent.	Class III	78 per cent
Class II	90 per cent.	Class IV	67 Per cent

He further shows the reduction in the earning power of capital, as demonstrated by the fall in the rate of interest, on the best class of securities, and the steady and enormous fall on the interest paid on Western farm indebtedness.

It is an old but wholesome adage "Let well enough alone." If under the continuous operation of a system of tariff laws "the vicious, illogical and inequitable source of unnecessary taxation," according to the distinguished head of the Low Tariff men, has resulted in "a period of the greatest progress in material welfare ever witnessed in this or any other country," according to a reputable and acknowledged statistician, and for twenty-five years the workingmen of this country have been "Tricked" and "Robbed" and "Burdened," with steadily advancing wages, and a constantly increasing purchasing power of these wages, isn't it a good business policy to continue this theoretically melancholy, but practically satisfactory condition, for some years further at least. "A bird in hand, is worth two in the bush," any time.

E. C. P.

OUR LOSS, ENGLAND'S GAIN.

A heavy falling off of iron and steel exports to the United States is noted by our English exchanges, and this in the face of increased exports from Great Britain to other countries. From 118,583 tons of iron and steel products sent to the United States in August, 1887, the total fell to 52,066 tons in August, 1888. Especially noticeable is the falling off in rail exports. In August, 1887, they were 19,890 tons; in August, 1888, they were only 159 tons. Taking the eight months ending August 31, 1888, we find that the exports of iron and steel to this country decreased 489,342 tons, the quantity being less than half that reported in 1887.

The only departments in which English manufacturers did a better business with the United States last month were those of tin plates (28,506 tons being sent against 22,558 tons in August, 1887), and hoops and sheets (6,368 tons against 3,571 tons). It is no coincidence, but an admitted fact, that these are the only two industries which are not adequately protected in the United States, and which, but for the refusal of Congress to afford a reasonable protection, would readily obtain a foot-hold here. Our Free Trade English competitors are not slow to see this, nor to avail themselves of our disadvantage. Thus the *Iron and Coal Trades Review* (London), commenting on the increased exports of tin-plates and cotton-ties above referred to, says: "This is not altogether surprising, for the canning and cotton industries, the former especially, are being rapidly extended over there, and, not being able to manufacture the tin-plates and hoops themselves, or to get them cheaply from other quarters, they are obliged to come to England. It is probable that they will continue to have to import, as the duty, on tin-plates at least, is much more likely to be abolished than to be increased." Thus are we held in the power of foreign manufacturers, because, forsooth, an American Congress will not see that it is to our interest to build up an important home industry.

OHIO OR SCOTLAND?

Mr. Frank W. Wheeler, of Bay City, Mich., one of the largest ship-builders in Michigan, employs from 500 to 800 men, and has a yard with a capacity for building annually twenty of the largest boats on the lakes. Recently he bought additional yard room at a cost of $25,000, preparatory to going into the building of iron and steel crafts. His projected improvements are at present held in abeyance, however, pending the outcome of the existing tariff agitation. To a reporter, the other day, Mr. Wheeler said:

I made the statement that it is impossible to compete here with the English ship-builders, and as an illustration I have described a steel ship built on the Clyde in Scotland. The ship was 2,000 tons burden, and was brought across the Atlantic and up through the St. Lawrence and Welland canal for the lake trade, and is owned by a man at Port Arthur, in Canada. I rode from Detroit to this city with him, and he gave me all the details. The ship cost in Scotland, $106,000, and to bring it through the canal it had to be divided in halves at an expense of $20,000 more, making the cost here, $126,000. Now, the same ship in every way built here will cost, at the lowest figure, $150,000 to $160,000, and the only difference in price is the amount extra paid here in wages.

Ninety-five per cent. of the cost of building an iron ship is the labor, taking, the raw materials to begin with, and any laboring man can plainly see where his wages will go if ships come here from the old country. I tell you the ship-building industry will be destroyed in this country if we are oblig d to enter into competition with the ship yards on the Clyde and other portions of Scotland and the old country, or else the wages, which are not a cent too high now, will be out below living wages.

Mr. Wheeler is undoubtedly correct. It has recently come to the knowledge of the IRON TRADE REVIEW that a gentleman interested in the construction of high-class steel vessels for lake service finds, as the result of inquiry abroad, that he can buy not only his machinery, but also his steel plates cheaper in Scotland than in the United States. To do so would take just that much business from American manufacturers capable of turning out a product equally good, and from American workmen the large per cent. of wages which would otherwise go into their pockets. If this is possible under the present tariff, what would be the result if the proposed reduction goes into effect?

TRIPLE EXPANSION ENGINES AGAIN.

Concerning the comparative merits of compound and triple expansion engines, in marine service, we are kindly permitted to make the following extracts from a letter recently received by an American gentleman from William Parker, Esq., Chief Engineer-Surveyor of the British Lloyds, and Member of the Council:

"Two large passenger steamers of over 4,500 gross tonnage, having engines of about 6,000 indicated horse power, built of the same dimensions, from the same lines, with similar propellers, are exactly alike in every respect except so far as their machinery is concerned, one working at a pressure of 145 lbs. per square inch, whilst the other vessel is fitted with ordinary compound engines, working at a pressure of 96 lbs. per square inch. Both vessels are engaged in the same trade, and steam at the same rate of speed, viz.: 12 knots per hour. The latter vessel on the round voyage, of 84 days, burns 1,200 tons more coal than the former.

"The performances of the next two vessels I am about to quote do not compare on a question of decreased consumption, but on one of enhanced carrying capacity, with an equal speed, and the same consumption of coal.

"The first vessel has a gross tonnage of about 2,220 tons, and is, comparatively speaking, a modern type of ship. She is fitted with ordinary compound engines,

working at a pressure of 90 lbs. per square inch, and carries when fully loaded, 3,000 tons of cargo, including bunker coal. She steams 10 knots per hour, and burns 20 tons of coal per day. The second vessel has a gross tonnage of 2,800 tons, was built last year, and fitted with triple expansion engines, working at a pressure of 150 lbs. per square inch. She makes a voyage to India in the same length of time as the former vessel, burns the same amount of coal, viz.: 20 tons per day, and carries 4,200 tons, or 1,200 tons more cargo with the same working expenditure.

"The next case I will take is that of a mail steamer, the engines of which have been converted from ordinary compound to triple expansive, the propeller not being altered. The vessel is 3,500 tons gross register, both ship and engines having been built by one of our leading builders. She was originally fitted [in 1871] with ordinary compound engines, working at a pressure of 60 pounds per square inch. These have been altered into triple expansion engines, and new boilers have been fitted, working at 150 lbs. per square inch. The vessel still maintains her original speed, and the consumption of coal has been lessened 25 per cent.

"In the case of another mail steamer, the engines of which have been altered in a similar manner, I have compared her present performances with those of ten previous voyages, and find that the decrease in consumption is 33 per cent., while the same speed is maintained.

"In these cases the consumption quoted included the steering engines, and other purposes, so that the economy gained in the main engines is greater than that given by these figures."

Reference, to the same effect, is also made by Mr. Parker to a paper read by him at the 27th session of the Institution of Naval Architects, at Liverpool, July 29, 1886 (the Right Hon. the Earl of Ravensworth, in the chair) on "The Progress and Development of Marine Engineering."

SAYS the *American Artisan*, of Chicago: "The IRON TRADE REVIEW, Cleveland, recently published a large and handsome edition of the paper in honor of Ohio's Centennial. It contained sketches of a large number of leading industrial cities in that State and other interesting matter. This Centennial edition was printed in blue ink, and was bound in a special and attractive cover."

CHEMICAL PROCESSES INVOLVED IN RUSTING IRON.*

BY PROFESSOR A. CRUM BROWN, F. R. SS. L. AND E.

In this short paper there is, so far as I know, no new fact described. I believe everything, or nearly everything, in it is to be found in the records of chemical research; but as I find that the process involved in the rusting of iron is often misunderstood, and that the known facts have not been put together in their connection, I have thought it might be worth while to do so. My attention was first called to the subject by observing what happens when a drop of rain falls on a clean, bright surface of iron. At first, for a short time, the drop remains clear, and the bright surface of the iron is seen through it; but soon a greenish precipitate forms in the drop, and this rapidly becomes reddish-brown. The brown precipitate does not adhere to the iron, but is suspended in the water, and becomes a loosely adherent coating only when the water has evaporated. I may premise that, in speaking of rusting, I mean the formation of rust on the surface of metallic iron exposed to ordinary atmospheric conditions.

I do not intend to treat of the corrosion of iron by substances such as sulphuric or sulphurous acid, hydrochloric acid, or any other occasional impurities which may be present in the air. It has been conclusively shown that the necessary conditions of rusting are—(1) metallic iron, (2) liquid water, (3) oxygen, and (4) carbonic acid, both the latter being dissolved in the liquid water. Iron remains quite free from rust in an atmosphere containing oxygen, carbonic acid, and water vapor, as long as the water vapor does not condense as liquid water on the surface of the iron.

Let us consider now the action on iron of the three substances, liquid water, oxygen, carbonic acid, singly, and then two and two. Liquid water, quite free from dissolved gases, does not act on iron at ordinary temperatures. At high temperatures, very rapidly at a red heat, iron is oxidized by water or water vapor, and is converted into the magnetic oxide of iron. This magnetic oxide is formed on the surface of the iron as an adherent coating, and only when it is detached can the water gain access to lower layers of the iron. Oxygen gas alone does not act at ordinary temperatures on iron. At high temperatures it also converts the iron into the magnetic oxide, which forms an adherent coating. The same is the case with carbonic acid gas, acting alone. At ordinary temperatures it is without action. At high temperatures the carbonic acid is reduced to carbonic oxide, and the iron is oxidized to magnetic oxide, which forms an adherent coating. Liquid water, with oxygen dissolved in it, does not act at ordinary temperatures on iron. This is shown by the fact that ordinary water exposed to the air does not rust iron if the water contains a substance such as lime, or caustic alkali, capable of combining with carbonic acid and itself without action on iron. As long as the lime or caustic alkali is there, no rusting occurs. When the lime or caustic alkali has been converted by the carbonic acid of the air into carbonate, then, and not till then, can the carbonic acid of the air dissolve as such in the water, and then, and not till then, does rusting begin.

Water containing carbonic acid dissolved in it acts on iron at ordinary temperature forming ferrous carbonate, which dissolves in the carbonic acid water, forming, no doubt, ferrous bicarbonate. In this way artificial chalybeate water has been prepared by shaking up finely-divided iron with carbonic acid water. In this action hydrogen gas is given off. Solutions have thus been prepared containing nearly one-tenth per cent. of iron. If oxygen is present, dissolved in water, it will unite with the nascent hydrogen, and if we have sufficient water, iron and carbonic acid, the whole of the dissolved oxygen will be thus consumed. The presence of dissolved oxygen quickens the solution of the iron, the tendency of the oxygen to combine with the nascent hydrogen supplying an additional motive to the action. Probably in ordinary rusting no hydrogen actually becomes free, as under ordinary conditions there will always be enough dissolved oxygen to convert all the nascent hydrogen into water.

When a solution of ferrous bicarbonate is exposed to an atmosphere containing neither free oxygen nor carbonic acid, it loses carbonic acid, and insoluble ferrous carbonate is precipitated. If free oxygen is present in the atmosphere to which it is exposed, the ferrous carbonate is oxidized into ferric hydrate, carbonic acid being given off. This, if the water is not already saturated with carbonic acid, dissolves in the water. We can now follow the whole process of rusting and divide it into stages—these stages being really separable, if we take proper precautions, but in the usual case overlapping one another. We have (1) the formation of soluble ferrous bicarbonate, (2) the conversion of ferrous bicarbonate into ferric hydrate, the white ferrus carbonate passing through green and black intermediate substances into the reddish-brown ferric hydrate, i. e. rust. We have to note that the carbonic acid dissolved in the liquid water, which is necessary for the process of rusting, is not used up in the process. It is given off during the oxidation of the ferrous bicarbonate to ferric hydrate, and is thus ready to act on the new surface of the metallic iron.

The continuation of the process of rusting is not, therefore, dependent on new carbonic acid absorbed from the air, but the original carbonic acid, if not removed, can carry on the process indefinitely, as long as the liquid water is present, and oxygen is supplied from the air. Once the process is started, it goes on more rapidiy, because the porous rust not only does not protect the iron, but favors, by its hygroscopic character, the condensation of water vapor from the air as liquid water. A piece of iron therefore, which has begun to rust will continue rusting in an atmosphere not saturated with water vapor, an atmosphere in which a piece os clean iron will not rust, because liquid water will condense on the hygroscopic rust from such an atmosphere, but not on the bright iron.

*Read at the Edinburgh Meeting of the British Iron and Steel Institute.

After Dinner Experience.

James F. Wilson, of New York, says that it will be noticed that most boiler explosions come, like black coffee, right after dinner. The reason for this, as he explains it, is that the water in the boilers is in perfect readiness to become steam, and would be such but for the pressure of the actual steam on top of it. When the dinner hour is over and the men and machines begin to work again, the valves are quickly opened, the steam rushes out and the water suddenly becomes steam. As steam has 1,700 times the expansion of water, the effect is an explosion.

LAKE SUPERIOR IRON NOTES.

Special Correspondence to the IRON TRADE REVIEW.

FLORENCE, Wis., Sept. 24.—The total shipments of iron ore from the Lake Superior district, for the season ending on Wednesday last, was 3,161,506 tons, against 3,337,477 tons shipped up the corresponding date last year, and 2,560,022 tons in 1886. The shipments by ranges were as follows: Marquette range, 1,246,778 tons; Gogebic, 910,418 tons; Menominee, 750,341 tons; Vermilion, 253,969 tons. The amount of ore shipped to Lake Erie ports during the week was 159,387 tons, divided among the various districts as follows: Marquette, 55,077 tons; Gogebic, 43,367 tons; Menominee, 43,597 tons; Vermilion, 17,356 tons. There is no falling off yet in the volume of shipments, as compared with the shipments one year ago, the amount of ore shipped by lake this season being only 175,975 tons less than the aggregate quantity shipped at the corresponding date of 1887. This amount, even, would undoubtedly have been considerably less were it not for the scarcity of vessels under season contract, and the constantly increasing freight rates. Most of the mines on the Menominee range have a sufficient tonnage under contract to transport their entire season's product at an average rate of $1 per ton. They are bothered considerably, however, over the dilatory spirit evinced by the vessel-owners, who, as long as they can secure cargoes of grain at high rates, prefer to take them and look after their ore charters when grain freights are dull. Miners continue scarce in this district. This necessarily retards mining, and, unless more men are forthcoming in the near future, many of the mine owners will be compelled to somewhat lower their estimate of the season's output. With all these disadvantages, and to which may be added the increase in lake freights, there is little doubt that at the close of navigation on December 1, fully 4,000,000 tons of ore will have been shipped from the Lake Superior district. Only a little more than 800,000 tons remains to be forwarded to reach the figures named. Were all the conditions favorable, the season's output would certainly greatly exceed the estimate given.

Successful Tests of Sheffield Steel Armor Plates.

The fourth of a series of trials of steel plates took place on board the Nettle, at Portsmouth, (England) last week. The plate, which was manufactured by Messrs. Vickers, Sons & Company, Limited, River Don Works, Brightside, Sheffield, was of the dimensions and thickness prescribed for these tests, viz., 8 feet by 6, and 10½ inches thick. It was fired at by a six-inch diameter breechloading gun, with a charge of 48 lbs. of powder, and 100 lbs. shot. The first shot was a Holtzer hardened steel shot, the point of which penetrated as far as the wood backing and was driven out again by the elasticity of the steel with such force that the shot struck the bulkhead through which the gun was fired. Only slight cracks were made round the hole made by the projectile. The second shot, also a Holtzer, did not penetrate to the backing, as far as could be seen. It rebounded in the same way as the first one, and caused a slight crack at the top end of the plate. The third and fourth Palliser, 98 lb. cast-iron chilled shot, which went to pieces against the plate, only causing an extension of the crack made by the second shot; and the fifth shot, another Holtzer, was also sent back to the front, after making a slight penetration in the wood backing. These results are considered as very satisfactory by those who witnessed them, the target having resisted all the shots fired at it, and looking quite able to resist still further trial. The shot appeared to be of ususually good steel, as only one seemed seriously distorted by the work.—[Ironmongery.

W. B. Pollock & Co., of Youngstown, Ohio, manufacturers of boilers and all kinds of rolling mill and blast furnace work, have been awarded the contract for all the iron work entering into the construction of the hot-blast stoves to be erected at the Tod Furnace of the Brier Hill Iron and Coal Company, at Youngstown. The contract is quite a large one and will keep the firm busy for some time to come.

Scribner's Magazine for October is notable for the varied interest of its contents and the eminence of its contributors in their special fields of work, among them being Lester Wallack, the Hon. Hugh McCulloch, Robert Louis Stevenson, Professor Aurthur T. Hadley, and H. H. Boyesen. The illustrations present an equal variety of subject and treatment.

THE largest carpet in the world is at the Cincinnati Exposition. It measures 2,700 yards in area.

A GREAT INDUSTRIAL ENTERPRISE.

One of the greatest, if not the greatest, industrial enterprise now actively under construction in America, says the Baltimore *Manufacturers' Record*, is the gigantic iron and steel plant which the Pennsylvania Steel Co. is building near Baltimore. This is a strong statement, but the facts will support it.

The Pennsylvania Steel Company is one of the greatest iron and steel-making concerns in this country. It is a large importer of foreign iron ore, used in making Bessemer steel, and has imported many thousands of tons through Baltimore. Appreciating the importance of having furnaces and steel works on the Atlantic coast, that the cost of freight on the ore might be lessened and water transportation be secured for its product. The managers of this company made a careful investigation as to the relative advantages of all the leading Atlantic ports for their business. Baltimore was finally selected, and no greater endorsement of the superior advantages of this city for manufacturing purposes could be asked. A tract of land a few miles below the city, embracing 1,200 acres, with a fine frontage on the Patapsco river, was selected and the work of preparing to build this great plant was then commenced. The town has been laid off, a large number of brick houses built, churches and schools established, and a good foundation laid for a great industrial center. Over 700 men are even now at Steelton. Two furnaces have been nearly completed, and these will be followed by two more in the near future, and others later on. These furnaces have been built with the view to making them the largest in the country, and their estimated output is 250 to 300 tons of iron a day each.

It is said to be the intention of this company to eventually build 8 furnaces of 250 tons each daily capacity. A Bessemer rail mill with a daily capacity of 1,000 tons, works for making steel plates for shipbuilding and other enterprises, possibly including the construction of steel steamships. When completed it will be one of the most perfect as well as one of the greatest iron and steel plants in the world. The pig iron will run directly from the furnace in its molten state to the rail mill. Every improvement known to modern science for reducing the cost of steel making to the lowest possible figure will be introduced regardless of expense. Between 3,000 and 4,000 men will probably be employed in these works when completed, and this giant plant will attract many others until the shores of the Patapsco are lined with great iron, steel, and ship-building works.

We may gain some idea of the vast business that these works will develop from a few figures. When the 8 furnaces, which it is intended to construct, shall have been finished, their consumption of ore, coke and limestone, and their production of pig iron will be almost beyond comprehension. They are expected to make 2,000 tons of pig iron a day. This will require about 4,000 tons of ore every day, or two full steamer cargoes daily, averaging 2,000 tons each. Of coke and limestone vast quantities will also be needed. The making of 2,000 tons of iron a day would necessitate the handling of upwards of 12,000 tons of material, counting the inward freight of coke, ore and limestone, and the outward freight of iron. This would mean the equal of 600 car loads of 40,000 pounds each daily, or 3,600,000 tons or 180,000 car loads a year. In freight tonnage this would be greater than 100,000,000 bushels of wheat.

CONFLICTING TESTIMONY UPON OIL FUEL.

The Engineer (New York).

There is a great discrepancy in the statements of persons who use oil as fuel, the testimony of experts and the records of severe tests as to the relative value of oil and coal as fuel. At the recent convention of electricians in this city, a paper on "Petroleum as a Fuel," by S. S. Leonard, of Minneapolis, attracted much attention. "The use of petroleum," the paper said, "resulted in a saving of twenty to twenty-five per cent. of the cost of fuel, and fifty per cent. of the cost of labor. He feeds the oil by gravity from an underground storage tank to the furnaces, and heats it with a steam coil in a six-inch pipe just before it reaches the burners. With a plentiful supply of hot air to the furnace, he gets a clear flame without smoke, which does not foul the flues. The cost, according to two tests which he made, he found to be, in one instance, 70 cents for 100 horse-power an hour against 86 cents for coal, and in the second test it was 62 cents for oil against 80 cents for coal."

Prof. Van der Weyde, of Brooklyn, did not agree with Mr. Leonard. "About a year ago," he said, "I had an opportunity to test the two fuels for a fortnight. I have not the exact figures, but I can give you the general result. When petroleum costs more than 40 cents a barrel it will be dearer than anthracite coal at $3.50 a ton delivered."

Mr. Sunny, of Chicago, said that his company was about to put in oil burners, and expected to save 30 per cent. Coal was good enough for Mr. De Camp, of Philadelphia. He used 12,000 tons a year, and his power cost 63 cents for 100 horse-power an hour. "I have known," he said, "of many people who tried petroleum, but they have abandoned it. Why, I do not know. In the oil regions I know that coal at $2 a ton is preferred to oil."

In view of the fact that the evaporative power of petroleum is one-fourth higher than coal, this difference of opinion and of results is remarkable.

Work for Ship-Builders.

Philadelphia Record.

Three million dollars' worth of contracts for new iron steamships will soon be given to the Delaware River ship-builders. Although the Cramps are crowded with work, the other yards have but little on hand, and are increasing their plant and buying tools during the temporary lull. The Chester and Williamington builders have room for more work.

Claus Spreckel's representative is bound here from San Francisco to secure larger steamships than have ever been built in the United States. They are designed for service to Australia. Negotiations are also now going on for the purchase of several large Delaware River tugs for service at San Francisco.

The Ocean Steamship Company, of Savannah, is about contracting for two steel passenger steamships for the coastwise trade between Philadelphia, New York and Savannah.

The Standard Oil Company is on the lookout for another new bulk oil-carrying steamer for the coastwise trade, and Boulton, Bliss and Dallett want more vessels, owing to the sale of two of their vessels for the Pacific coast trade. This firm now has a vessel on the stocks in Cramp's yard. The Clydes are contemplating a new steamship service in the West Indies, probably to Hayti and the Windward Islands, and want first-class vessels for that venture.

The outlook is encouraging and within twelve months there will be work enough on hand for vessels for the merchant service to keep all the yards on the Delaware River busy for two years.

A New Iron Ore Fleet.

It has been contemplated by Ashland capitalists for some time past, to purchase, build or control a fleet of ore vessels. This project has at last assumed definite proportions, and it is now quite probable that a fleet of ore vessels owned exclusively by Ashland individuals will ply between this city and Lake Erie ports, next season.

The matter is now in the hands of practical marine men, who understand all the ins and outs of the vessel business. The scheme is to form a syndicate to invest in good vessel property this Fall, when it can be purchased at a reasonable figure.

During the past three years there were vessels running to this port which make a handsome sum every season. Ashland is considered one of the best ports on the lake. The vessels last year brought up an average of 1,500 tons of coal at $1, and returned with ore at $2.50, which made a total $5,000 for each trip, and as nearly all of them averaged five trips during the year, it made the total receipts for each vessel about $26,000. This young fortune makes the marine business look like a very tempting plum for capitalists, and there is no reason why Ashland with her vast marine interests should be shut out entirely from the carrying trade. The project is perfectly feasible, and will aid in giving our marine interests a more substantial basis than they have had heretofore.—[Ashland (Wis.) Press.

The Tehunantepec Canal.

The Americans who endeavored to raise capital for the Tehunantepec Ship Canal, have left London, unsuccessful. English moneyed men want a government guarantee; it is believed that this cannot be obtained, and the Mexican subventoin is insufficient. The gentlemen named are said to have acted unwisely in taking over a third-rate contractor named Tancred, and an engineer named Taylor, both of whom have been heard of considerably in the past in connection with the Delagoa, the Messina, and other railroads.—[Australasian.

FOREIGN IRON TRADE ITEMS.

Iron & Steel Trades Journal, London.

Nearly 1,000 miles of railway were completed in India last year.

The freight on pig iron from Glasgow to New York is 7s. 6d. per ton.

A well-known Leeds firm has just taken a good order for a number of tank engines for the West Indies.

There is no foundation for the report circulated by a contemporary that a "ring" of steel makers has been formed.

It is understood that Messrs. Charles Cammel & Co. (Limited), Sheffield, have recently received some important orders for steel rails on export account, in addition to the Japan order reported a few weeks ago in these columns.

A new method of casting steel guns has been patented by Dr. Gatling, who employs a central core which is water-cooled, and round which the casting is made. He also gives the mould in which the gun is cast a revolving motion, the result being to make the gun spiral.

As an instance of what can be done by using labor-saving machinery, we may state the gradual introduction of new appliances in a foundry and engine shop, has resulted in 50 men producing as many castings as was formerly turned out by 200 men.

The Argentine Railway Bureau has published some valuable information dealing with railways, from which we gather that there are 17 railways at present working in the Republic, that concessions for 20 have been granted, and that 90 applications for concessions are before Congress.

The value of minerals raised in the United Kingdom in the year 1887, according to the official return, was £55,326,164; and in 1886 the total value was £55,010,231. Of metal obtainable from ores in the year 1887 the average market value was £12,997,847, and in 1886, £12,848,739.

Messrs. Krupp, of Essen, have decided to open a branch establishment in Russia, in the neighborhood of Ekaterinoslaff, where they will manufacture steel guns for the Russian Government. The engineers of Messrs. Krupp have already arrived at the site of the proposed works, where they are buying up land.

The Acieries-de-France tested last week at their Isbergues Works, Lille, the rolls which they are making for the manufacture of the "Goliath" rails ordered for the German State railways. The trials proved satisfacfactory, and these first rolls were approved and passed by the Belgian commission.

A congress of iron masters, mine owners, mining engineers and inspectors is now sitting in Vienna. The output of iron, the means for introducing additional safety into the working of mines, the wages of pitmen, and the differences in the taxes of raw materials and iron manufactured products in various countries, are the principal subjects to be discussed.

About £36,000 worth of metals and machinery were imported into Samoa last year. It was claimed by the Germans that they had a monopoly for that market. It appears that of the German exports four-fifths are of British manufacture and acquire German ownership before reaching Tonga. Germans are clever. Consett steel has won German firms considerable honor.

A Theory of Steel.

The Society of Chemical Industry's *Journal* contains an abstract of a paper giving outlines of a theory of steel, by F. C. G. Mueller. The author has undertaken the investigation of those substances which have an important influence in determining the properties of steel, and the present article treats chiefly of the black powder which forms the residue from the treatment of slowly-cooled steel with dilute acids. This substance, which has already been the subject of research by Abel and Deering—*Journal*, 1885, 284-286—as well as by Osmond and Werth—*Journal*, 1886, 493—has a constitution approximating to the formula Fe_3C. It is decomposed by hot strong hydrochloric or sulphuric acid with evolution of carbureted hydrogen, and then leaves a residue of a composition which may be expressed by the formula C_8Fe. Carbon exists evenly alloyed with iron, only in hardened steel, whilst by slow cooling it tends to collect in separate centres, in the form of the compound Fe_3C. The presence of much silicon prevents the formation of this body, and the separated carbon particles take the form of graphite. Certain other elements, such as phosphorus, copper, and especially tungsten, prevent the separation of the carbon, and must have a great hardening effect on the steel.

Industrial Notes

Blast Furnaces:—

Norway Furnace, at Bechtelsville, Pa., operated under lease by Gabel, Jones & Gabel, of Pottstown, Pa., is at present undergoing extensive repairs. It will resume blast about November 1, next.

The Red Jacket Furnace, this city, turned out 5,300 tons of iron during the month of August. This is the largest monthly output of the furnace with one single exception.—[New Castle (Pa.) Guardian.

Fanny Furnace, operated by J. C. Hamilton, Shawnee, Ohio, trustee, will resume operations in a few weeks. A new bosh has been put in, general repairs have been made, and a new brick casting house, 37x85 feet, is being put up to replace the old one, recently destroyed by a wind storm.

Rolling Mills:—

The Cleveland Rolling Mill Company have purchased the barbed wire plant of Billings, Taylor & Co., on Case avenue, and the machinery will soon be transferred to the mills in the Twenty-seventh ward.

The Springfield (O.) *Union* says: The test steel plant erected by the James Leffel Company for the purpose of thoroughly testing the process purchased by Mr. Bookwalter, in France, of making steel from a low grade iron, is about ready to start.

All the puddling furnaces at the Etna Iron Works, this city, are now on. The guide mill at the Etna Iron Works, this city, went on double turn Monday. The nail mill at the Etna Iron Works, this city, has been changed into a pipe mill. The change was made under the superintendence of Andrew Myers.—[New Castle (Pa.) Guardian.

Recently P. L. Kimberly made a proposition to his employes in the Etna Iron Works, New Castle, Pa., to go to work. The men considered the matter and acquiesced. As a consequence the rolling mill began operations Monday, 23 puddling furnaces being fired up on that day. It is expected that the guide mill and nail factory will also soon be going. The proposition made by Mr. Kimberly, to his men, is probably the same as that submitted to and accepted by his employes in the Greenville rolling mill. At that establishment it was agreed that the men were to work six weeks and then get two weeks' pay, with pay every two weeks after.

Machine Shops:—

Incorporated: The Brown Self-Sharpening Mowing Machine Co., Kittery, Me. Capital, $500,000. Joseph F. Paul and Edward C. Pike, Boston, Mass., incorporators.

The Keith Machine Co. has been organized at Saco, Me. Capital, $250,000. Geo. R. Holmes, Bradford, Mass., and Frank F. Stanley, Swampscott, Mass., incorporators.

Witherow's Works, New Castle, Pa., have obtained still another contract. The company has orders to furnish the building for the hammer shop of the Latrobe (Pa.) Steel Works. Over 500 tons of iron will be required for the contract. Sixteen trusses will be constructed.

Messrs. Eynon & Ingersoll, manufacturers of machinists' tools, Cleveland, O., are building a new factory on Lake street, 100x40 feet, three stories high, with L on Kirtland street, 100x40 feet, two stories high. These buildings will be equiped with the latest designed machinery. They will carry on the manufacturing of milling machines, boring mills and shapers.

The Laidlaw & Dunn Company, Cincinnati, have had a magnificent trade this entire year. Their very interesting exhibit at the Exposition has attracted much attention and favorable comment. This company is abreast of the times, with every improvement that ingenuity can devise. Their boiler feeders and steam pumps are in great favor with engineers.—[Artisan.

The Hughes Steam Pump Co., of Cleveland, have just completed the boilers and pumping machinery for the Salisbury (Md.) Water Co. The pumping engines which is a credit to the industries of Cleveland, has a capacity of 500,000 gallons per diem, and is of the compound duplex non-condensing type. The water board speak in the highest terms of the company and its machinery.

One of the most imposing processions of workmen that has passed through our streets for some time, was that of the employes of Messrs. Lodge, Davis & Co., manufacturers of iron-working machinery, on Saturday, the 15th inst. About two hundred and fifty men were in line, all employes of the firm, headed by a band, followed by a banner-bearer carrying a beautiful silk banner, upon which was inscribed the name of the firm and its business. The occasion was a compliment to the men from their enterprising employers, who bore the entire expense of admission tickets for all, beside paying each man his regular wages for the time thus spent in recreation and pleasure.—[Artisan, Cincinnati, O.

The Wheeler & Wilson Sewing Machine Company, of Bridgeport, Ct., has shut down. President Nathaniel Wheeler says: "One object of the suspension is to gather in a portion of our capital. In the hands of our agents in the United States and Europe there is a five months' supply of machines representing a value of more than $3,000,000. This move has been contemplated for months, but, owing to active business it could not sooner be carried into effect. The business has been such that, during the inventory in January last, it was deemed expedient to actually shut down the work only a few days, and the inventory was taken rather hurriedly and under disadvantages. The real reason for a two weeks' suspension is to give an opportunity for reorganization of the selling department and for making important alterations in machinery. After Sept. 15, probably the full number of hands will be re-employed."

Foundries:—

The largest cotton press ever built at the works of the Scott Foundry & Machine Company, Limited, at Reading, Pa., was shipped to Brunswick, Ga., last week. The press weighs 230 tons, standing on a base 12x24 feet, connecting with four links 38 feet long and each weighing 9 tons. One of the castings of the press weighs 25 tons.

The Globe Foundry is a new enterprise which was incorporated by Wellston (O.) parties several weeks ago. The capital stock is $15,000. The incorporators have purchased the foundry buildings recently erected by Spellacy Brothers, and will at once equip and start it in operation to manufacture all kinds of miners' supplies, such as cars, tools, etc., and make all kinds of engines, machinery, etc.

The Ranken & Fritsch Foundry & Machine Company have filed articles of incorporation in the recorder's office with a capital of $150,000. The stockholders are John D. Ranken, formerly of the Smith, Beggs & Ranken Machinery Company, and purchaser of the plant and realty of that concern—570 shares; Bruno Fritsch, vice-president of the St. Louis Iron & Machine Works, from which he has just retired after disposing of his interest in the same—570 shares; Wm. H. Thomson, cashier of the Boatman's Savings Bank, 114 shares; Otto N. Von Shrader, 171 shares; T. C. Whittemore, 20 shares; Aug. Thury, 15 shares; Christ J. Dorn, 25 shares; Henry Luehrsel, 15 shares.—[Age of Steel, St. Louis.

The Portage Lake Foundry & Machine Works, of which Messrs. Stephen E. Cleaves & Son are proprietors and managers, are showing just now some marked signs of growth and prosperity. The twelve acres of lake front land belonging to Mr. Cleaves and containing his shops and dwellings have been fairly well covered with buildings heretofore, but more of the space is soon to be occupied in that way. The machine shop addition, which was begun in June, is now completed except the erection of the machinery. Its dimensions are 40x 40 feet, while those of the shop as it stood before, are 40x80 feet, making the completed building 40x120 feet. The principal piece in the machinery equipment, of the addition, is to be a lathe weighing twenty-eight tons, the largest in the Upper Peninsula outside of the machine shop of the Calumet & Hecla Mining Company. It is being made by the Niles Tool Company, of Hamilton, Ohio, and will arrive in a short time. A strong stone foundation for a new foundry building, 62x150 feet in size, has recently been laid around the foundry building now used.—[Houghton (Mich.) Mining Gazette.

Hardware:—

The Al. Baldwin Machine and Hardware Company, has been organized at New Orleans, La., capital stock $400,000, with privilege to increase to $500,000.

The Celina Tack and Nail Company have been incorporated at Celina, Ohio, with a capital stock of $20,000. B. S. Taylor and others are the incorporators.

The Iowa Farming Tool Co., Fort Madison, Iowa, are putting in a plant for the use of crude oil as a fuel, instead of anthracite coal. The expense attending this departure is considerable, but it is anticipated that it will give better results, and diminish the cost of producing the goods.

Miscellaneous:—

Incorporated: The Paducah Industrial Iron Works Co., Paducah, Ky. Capital $30,000. G. D. Liming and others, incorporators.

Incorporated: The Anchor Iron Car Roofing Company, of East St. Louis; capital stock, $50,000: incorporators, H. D. Sexton, Henry O'Hara and Royal J. Whitney.

The Novelty Steel Company has been organized in Pittsburgh with a capital stock of $500,000. Washington, Pa., has made special inducements to the company to locate there and the company has accepted them. A plant costing 100,000 will be erected immediately, having a capacity of 30,000 wheels yearly or 100 sets per day.

The amounts of money paid out monthly by each of the following iron industries of New Castle (Pa.) are as indicated: Johnson's Sheet Mill, $20,000; Etna Iron Works, $20,000; Witherow's Works, $12,000; New Castle Wire Nail Works, $10,000; Crawford Iron & Steel Co., $6,000; Oliver Bros. & Phillips, $5,000; Baldwin & Graham's Stove Works, $4,800; Etna Furnace, $4,000, Raney & Berger Furnace, $4,000; New Castle Paper Mill, $1,000; total, $86,000.

The Cleveland Steam Fitting Co. is a new corporation, having just commenced business on Hamilton street, near Case avenue. Messrs. T. Meikle, P. R. Crawford and H. Smith, the members of the firm, are all practical steam fitters, and understand their business thoroughly. They are prepared to make estimates on all kinds of high and low pressure and exhaust steam heating. All sizes of pipe are cut to order. Their works are fitted up with the latest and most improved tools, manufactured by Cox & Sons, of Philadelphia. We wish them success.

The fortification bill which has just passed Congress will afford plenty of work for Boston mechanics. The 50 12-inch steel-hooped mortars, for which $250,000 are appropriated, are a specialty of the South Boston Iron Works, and the contract will naturally go to that company. In addition to this the act authorizes the new ordnance board to contract for 100 cast iron mortars to cost not more than $6,500 each. This will give substantial encouragement to the South Boston company, which has an extensive plant and is in perfect condition to do the work.—[Boston Commercial Bulletin.

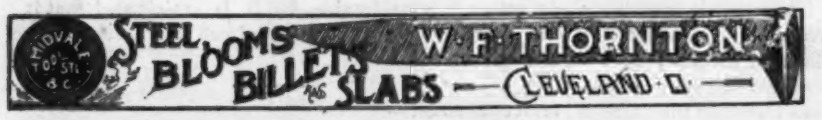
The New Castle industries mentioned handle monthly the amount of freight designated. The first column shows the number of tons received and the second column the number of tons shipped:

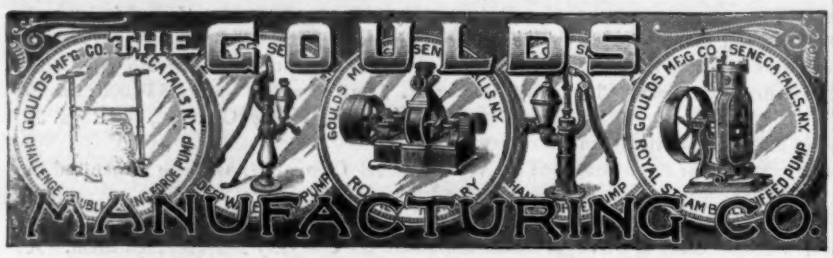
Crawford Iron & Steel Co.	17,000	5,000
Oliver Bros. & Phillips	14,000	4,000
Raney & Berger	11,000	3,000
Etna Furnace	15,000	4,000
A. W. Johnson (sheet mill)	8,000	1,200
New Castle Wire Nail Co.	8,000	1,200
Etna Iron Mill	6,000	1,000
J. P. Witherow	800	600
Paper Mill	300	100
Baldwin & Graham	225	—
Total	80,325	20,100

In addition to the large works of the Cowles Aluminum Smelting Co., at Lockport, N. Y., the Cowles Syndicate Co., Limited, have erected in England (near Stoke-upon-Trent), and have now in full operation, running night and day, a large plant, which will be increased from time to time to meet any demands which may arise.

The success of the paint manufacturing industry in this section, seems to be assured, and, as a result, two such companies are doing a thriving business in that line. In conversation with Col. S. B. Lowe, of the Chattanooga Paint Company, yesterday, a reporter learned that in the past four weeks that company has turned out an average of 72 tons of paint per week—12 tons per day! A ready market is found for the goods, and, in fact, the demands have been so pressing that the company operate twenty-three and one-half hours out of twenty-four, only ceasing long enough to clean grates. The shipments of the commodity are made principally to Mexico, Oregon, Texas, California, and the border States; but the interior is not behind hand in order, and the company report a steady patronage from all sections of the country. Col. Lowe claims that the paint manufactory can be made to average 80 tons per week.—[Chattanooga Times.

One acre of Wall street, New York, is worth $14,300,000.





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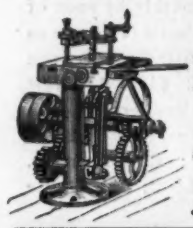

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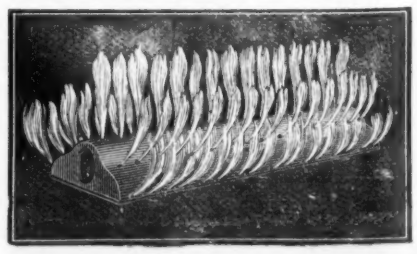

MARKET REVIEW.

OFFICE OF IRON TRADE REVIEW.
CLEVELAND, O., WEDNESDAY EVENING, September 26, 1888.

Iron Ore.

There is no visible supply above ground at Lake Superior ports, and shipping is now confined to the daily production. The prospects now are that every pound mined until the close of navigation will have to come down. Eastern inquiries for lake ores are plentiful, and one firm here has a standing offer of $4.50 for a good non-Bessemer hematite which, at the opening of the season, sold freely at $3.60. One of the mines which will be heard from, next season, is the Dunn, at Crystal Falls, on the Menominee Range. With only two drums at work, the mine is shipping 1,000 tons a day, and within the twelve months, since ground was first broken there, the mine has produced an even 100,000 tons. With more equipment, it will not be much of a trick to ship 250,000 tons of Dunn ore next season. Hard ores, as far as can be learned, are all sold, and dealers agree that the market has not been as barren of ores for many a year. There is no boom, but at an advance of from 50 cents to $1 over Spring prices, no ore is to be had. The trade opened up with an unsold balance at Lake Erie ports of 700,000 tons, but the market has not only absorbed that, along with the output, but is looking for more ore, thus showing a greater total consumption than in any year since the lake trade began. Barring unforeseen events, the 12 months from May 1, 1888, will show the greatest business year in the history of the ore trade.

Pig Iron.

There has been another sharp advance in foundry irons, induced by the enormous consumption, and the constantly lessening pig stock. No. 1 foundry is now quoted in the valley at $17.50@$18, and mill irons bring $16 easily. One sale of 200 tons is reported here, of selected foundry pig, at $18. The market is firm, with an upward tendency, and the repeated inquiries point to a good trade far into 1889. We quote. f. o. b., Cleveland, four months :

CHARCOAL PIG IRON.

Lake Superior Charcoal all numbers	22 00@24 50.

BITUMINOUS AND COKE IRON.

No. 1 Bessemer	$18 70@19 20
No. 1 foundry, all lake ores	18 20@18 70
No. 2 same	17 20@17 70
No. 1 foundry, lake ores, with cinder mixture	17 20@17 70
No. 2 same	16 20@16 70
No. 1 silvery, native Ohio ores	16 50@17 50
No. 2 same	15 50@ 6 50
No. 1 gray forge, red short	16 70@17 20
No. 1 gray forge, neutral	16 20@17 70
No. 1 American Scotch (Black Band)	17 70@18 20
No. 2 American Scotch "	16 70@17 70

Manufactured Iron.

Bar iron, which is selling at $1.70, is in good demand, but is not maintaining its price proportionate to the advance in the pig. Sheets are scarce, $3.10 being the figure asked for No. 27, with long delivery. Rails are weak, and the Western mills will have no orders after October 15, while the demand for structural iron still keeps up at the combination prices.

Scrap Iron.

There is no material change in prices, but old rails are so freely offered that there is good ground for believing that the $25 price will soon collapse. The railways are suspected of backing the brokers in this corner, but no especial inconvenience is experienced by mill men.

Hardware.

The market is lively, and a steady demand keeps the jobbers busy. They report an excellent trade in general.

LOUISVILLE PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Geo. H. Hull & Co.

Prices remain firm, and a fair number of orders have been booked during the last week. The outlook is a favorable one, and it is thought that prices will slightly advance. Rates of freight from Southern furnaces advance 15c. a ton, taking effect October 1st, and consumers will have to stand this, as furnaces are in shape to place all the iron they have to offer for delivery during the balance of the year. Louisville houses have made sales East during the past week at prices 50c. a ton higher than can be obtained West. Old rails and wheels are firm at $24.00 and $21.00. We quote as follows (Sept. 24) :

Southern Coke, No. 1, Foundry, $17 00@$18 00; Southern Coke, No. 2, Foundry, $16 00@$16 50; Southern Coke, No. 2½, Foundry, $15 50@$16 00; Hanging Rock Coke, No. 1, Foundry, $17 25@$17 75; Hanging Rock Charcoal, No. 1, Foundry, $21 00@$23 25; Southern Charcoal, No. 1, Foundry, $18 00@18 50; Silver Grey, different grades, $14 50@$15 25; Southern Coke, No. 1, Mill Neutral, $14 75@$15 25; Southern Coke, No. 2, Mill, Neutral, $13 75@$14 75; Southern Coke, No. 1, Mill, Cold Short, $14 25@$14 75; Southern Charcoal, No. 1, Mill, $15 75@$16 50; White and Mottled, different grades, $13 50@$13 75; Southern Car Wheel, Standard Brands, $23 00@$24 00; Southern Car Wheel, other brands, $19 25@$21 25; Hanging Rock, Cold Blast, $22 25@$25 25; Hanging Rock, Warm Blast, $19 25@$20 25.

CINCINNATI PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co.

The week has been without events of importance in the iron market. Sellers' views have been stiffened by the confidential report of the Western Pig Iron Association that stocks of pig iron were further reduced over 40,000 tons in August. Notwithstanding increase of production, it is known that reduction in stocks is also going on this month. Demand, while uniform and satisfactory, is not what might be termed active, and the volume of business is only about average. There is a steady call for mill iron, which cannot be met by furnaces North or South. The feeling of buyers and sellers is that prices are about high enough for a permanently healthy market. A further advance would open the gates for foreign iron, and start the fires in many idle furnaces. We quote for cash (Sept. 22) :

HOT BLAST FOUNDRY.—Ohio and Southern Coke, No. 1, $17 50@$18 50; Ohio and Southern Coke, No. 2, $16 50@$17 50; Ohio and Southern Coke, No. 2½, $15 50@$16 00; Ohio Soft Stonecoal; No. 1, $17 00@$17 50; Ohio Soft Stonecoal No. 2, $15 50@$16 00; Mahoning and Shenango Valley, $17 50@$18 50. CHARCOAL IRON.—Hanging Rock Charcoal No. 1, $21 00@$22 50; Hanging Rock Charcoal No. 2, $19 50@$22 00; Tennessee and Alabama Charcoal No. 1, $18 50@$19 50; Tennessee and Alabama Charcoal No. 2, $17 00@$18 00. FORGE—Strong Neutral Coke, $14 75@$15 00; Mottled Neutral Coke, $13 50@$13 75; Cold Short Coke, $14 50@$14 75. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $20 00@25 00; Hanging Rock Cold Blast, $22 00@$25 00; Lake Superior Malleable & Car Wheel, $21 00@$22 00.

CHICAGO PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co., W. W. Backman, Resident Agent.

Foundries in Chicago and the Northwest are generally doing active business, and buying more freely for their legitimate wants than they were doing a year ago. So far, they have no trouble in supplying all their wants, either for immediate or scattered deliveries. The market, however, is strong, and those who expect, in making round purchases, to get considerable concessions from ruling figures find themselves mistaken. Demand for Lake Superior charcoal has revived somewhat during the past week, as the car works are beginning to feel the effect of increased demand for rolling stock from the railroads. We quote for cash f. o. b. Chicago (Sept. 22) :

Coke and Bituminous Coal Foundry:—Ohio (Hanging Rock softeners'), $18 50@19 00; Ohio (Black Band softeners), $18 50@19 00; Ohio (Jackson county softeners), $18 25@18 75; Lake Ore and Cinder softeners, $17 75@18 25; Southern coke foundry No. 2, $17 50@18 00; Southern coke foundry No. 2½, $17 00@17 50; Southern coke foundry No. 3, $16 50@17 00. Old material:—Old iron rails, $24 00@25 00; Old car wheels $19 00@20 00. Charcoal Foundry:—Lake Superior, $19 50@21 00; Southern, $19 50@21 00; Hanging Rock, $21 00@23 50. Car Wheel and Malleable:—Lake Superior, $19 50@21 00; Standard Southern, $21 50@26 50; Hanging Rock Cold Blast, $24 50@27 00; Hanging Rock Warm Blast, $22 50@24 50.

DETROIT PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by William F. Jarvis & Co.

There has been very little change in the market during the past week. Considerable business has been transacted, and no concessions have been made in any case. Prices have been very firm at the advance recently reported. The confidence that prices will be higher in the near future is shown by the number of buyers that desire to purchase who are not consumers of iron. This is further demonstrated by the action of some large consumers, who placed orders about sixty days ago for their wants during the next six or eight months, but who have purchased during the past week, an additional quantity almost equal to their original purchases. We quote for the present as follows (September 24) :

Lake Superior Charcoal, all numbers, $20 00@$20 50; Lake Superior Coke, all ore, $19 75@$20 25; Lake Superior coke, cinder mixed, $18 50@$19 00; Standard Ohio Blackband, $19 75@$20 25; Southern No. 2, $17 75@$18 25; Southern Gray Forge, $16 25@$16 75; Southern Silvery, $17 00@$17 50; Jackson County (Ohio) Silvery, $18 50@$19 00; Old Wheels, $20 50@$21 50.

ST. LOUIS PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co

There has been a fair demand for pig iron during the week, and while standard Southern grades, particularly No. 2 foundry and No. 1 mill have been in short supply and held very firmly, buyers have been able to cover actual wants without difficulty. So far as Southern furnaces are concerned, the increase of production that has been looked for, for twelve months' past, seems to be as far away as ever. Increased Eastern and Southern demand about keeps pace with the slow increase in production, by blowing in of new furnaces. We quote for cash f. o. b., St. Louis (Sept. 22) :

Charcoal Foundry—Southern No. 1, $18.50@$19.50; Southern No. 2, $18.00@$19 00; Missouri No. 1, $17 00@18 00; Missouri No. 2, $16.50@$17.50. Coal and Coke Irons.—Southern No. 2, $17 00@$18 00; Ohio Softeners, $18 00@21 00. Mill Irons.—Southern No. 1, $15 50@$16 50; Southern No. 2, $15.00@16 00; Missouri, $16 00@16 50. Car Wheel & Malleable Irons.—Southern, $20 00@24 00; Lake Superior, $20 50@21 50; Connellsville Coke, East St. Louis, $4 45; Connellsville Coke, St. Louis, $4 60.

THE IRON INDUSTRY IN SPAIN.

British Consul Young, in his report on the trade of Bilbao for 1887, states that 68·4 per cent. of the iron ore exported, went to England and Scotland, the ports importing the larger quantity ranging in the following gradation: Middlesbrough, Newport, Cardiff, Glasgow, Newcastle, Stockton, Swansea, Sunderland, Hartlepool, &c. British tonnage monopolized 96 per cent. of the total iron ore imported into the United Kingdom. Three establishments export pig iron from this port, viz., the Altos Hornos Company, the San Francisco Company, and the Vizcaya Company. The Altos Hornos Company have three blast furnaces, producing each an average rate of 600 tons per week, and export only the quantities produced in excess of their own requirements. To make one ton of pig iron, they consume 17 to 18 cwt. of coke. The San Francisco Company have four blast furnaces, with 13 Whitwell hot pressers. Each of these yields 300 tons per week, requiring 19 to 20 cwt. for each ton of pig iron. The Vizcaya Company possesses only two blast furnaces—Cockerill system—each of them producing 600 tons per week. The consumption of coke is about 18 cwt. for each ton of pig iron. In the year 1886 the exportation of pig iron from said works amounted to 42,206 tons. The exportation of pig iron will probably fall off, however, first, on account of producers not being yet in a position to compete in foreign markets (Italy excepted); and second, owing to the home demand, where Bilbao pig iron has already driven out the English. The attention of producers, therefore, is now more particularly directed towards promoting and implanting in the country different metallurgical industries, where their produce may find a more secure and easier market. The commercial progress of Spain has been steady and remarkable of late years, and Chambers of Commerce have now been established in all the principal places. The necessary plants for the manufacture of Bessemer steel, of steel plates by the Siemens-Martin process, and of tin-plates and galvanized sheets, buckets, etc., have recently been or are now erected. Judging from the animation of different industries in this country, the many new lines of railway, and by the general satisfactory prospects all round, there would appear to be a good field for British enterprise. With the exception of mining, all industries are still exempted from any taxes in the Basque provinces, and foreigners enjoy the same privileges and immunities as the natives.

Alden's Manifold Cyclopedia.

The second volume of this work, now upon our table, even better than the first, fulfills the promises of the publisher's prospectus. It is a really handsome volume of 640 pages, half Morocco binding, large type, profusely illustrated, and yet sold for the price of 65 cents; cloth binding only 50 cents—postage, 11 cents extra. Large discounts even from these prices are allowed to early subscribers. It is to be issued in about thirty volumes. The Manifold Cyclopedia is, in many ways, unlike any other cyclopedia. It undertakes to present a survey of the entire circle of knowledge, whether of words or of things, thus combining the characteristics of a cyclopedia and a dictionary, including in its vocabulary every word which has any claim to a place in the English language. It form of publication is as unique as its plan—the "Ideal Edition" its publisher calls it, and the popular verdict seems to sustain his claim. It certainly is delightfully convenient. It will will not be strange if this proves to be the great popular cyclopedia. It certainly is worthy of examination by all searchers after knowledge. The publisher sends specimen pages free to any applicant. John B. Alden, Publisher, 393 Pearl street, New York, or Lakeside Building, Chicago.

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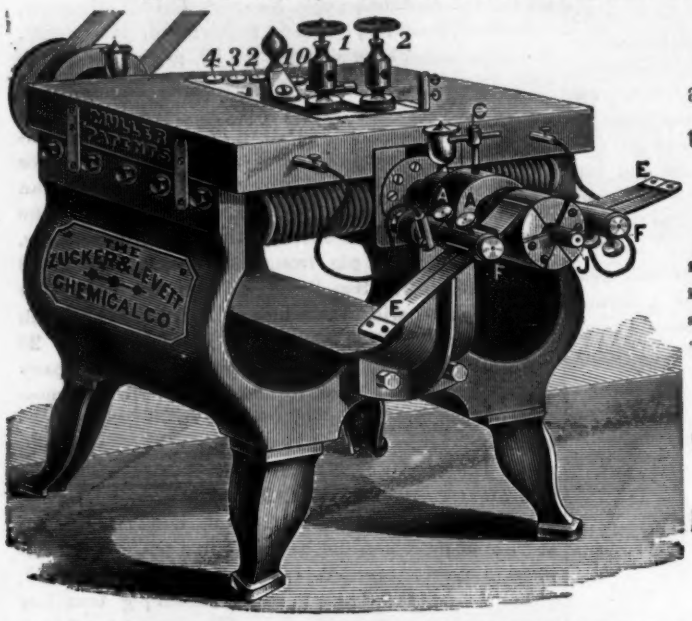

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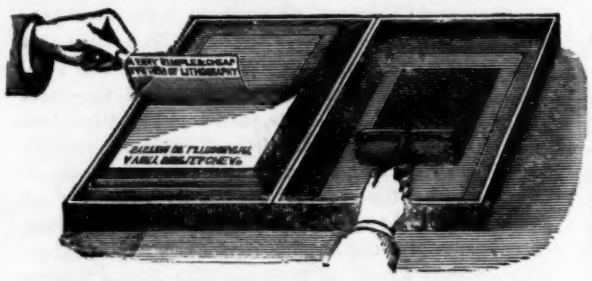

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Colwell & Collins Norway Bolt Co., Cleveland, O..... 10

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P. L. Sword & Son, Cleveland, O..... 18
Frey, Sheckler & Hoover, Bucyrus, O..... 18

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Fay Manufacturing Co., Elyria, O..... 2
J. A. Weston & Co., Syracuse, N. Y..... 10
A. W. Gump & Co., Dayton, O..... 19

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Buckeye Bridge & Boiler Works, Cleveland O..... 10
J. C. McNeil Co., Akron, O..... 10
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Mansfield Steam Boiler Works, Mansfield, O..... 10
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W. J. Rainey, Cleveland, O..... 10
Pittsburgh & Wheeling Coal Co., Cleveland, O..... 10
Andrews, Hitchcock & Co., Cleveland, O..... 10

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Felix Daus & Co., New York..... 12

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Phœnix Iron Works, Cleveland, O..... 1
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Wm Tod & Co., Youngstown, O..... 20

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Cleveland Wheel & Foundry Works, Cleveland, O..... 18

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Coal Screens—
Forest City Wire & Iron Works, Cleveland, O..... 1

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Bickford Drill Co., Cincinnati, O..... 1
Universal Radial Drill Co., Cincinnati, O... 1
E. Gould & Eberhardt, Newark, N. J..... 2
Lodge, Davis & Co., Cincinnati, O..... 19

Engineers and Contractors—
E. H. Jones & Co., Cleveland, O..... 1
Jas. P. Witherow, Pittsburgh, Pa..... 2
Alex. Laughlin & Co., Cleveland, O..... 10

Elevators—
L. S. Graves & Co., Rochester, N. Y..... 2

Electro-Plating Machines—
Zucker & Levett Chemical Co., New York... 12

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Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago Ill..... 1
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Eclipse Electrotype & Engraving Co, Cleveland, O..... 10
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Kilby Manufacturing Co., Cleveland, O..... 1
G. L. Chapman, Alliance, O..... 10
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C. & G. Cooper Co., Mt. Vernon, O..... 19
Lloyd & Griffith, Erie, Pa..... 19
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Schleicher, Schumm & Co., Philadelphia, Pa., and Chicago, Ill..... 19

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Cleveland City Forge & Iron Co., Cleveland, O..... 1

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Bowler & Co., Cleveland, O.....10 & 17
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J. H. Outhwaite & Co., Cleveland, O..... 10
Pickands, Mather & Co., Cleveland, O..... 10
H. E. Collins & Co., Pittsburgh, Pa..... 10
Cleveland Iron Mining Co., Cleveland, O.... 10

Key-Way Cutters—
Morton Manufacturing Co., Romeo, Mich... 10

Lumber—
Fisher & Wilson Co., Cleveland, O.....10 & 18
Martin & Barris, Cleveland, O..... 10

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Muller Machine Co., Cincinnati, O..... 1
Sebastian, May & Co., Cincinnati, O..... 19
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H. L. Shepard, Cincinnati, O..... 19

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American Manufacturing, Mining & Milling Co., Cleveland, O..... 20

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Geo. A. Ford, Cleveland, O..... 10
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Harmon, Gibbs & Co., Corry, Pa..... 10

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A. I. Sanger, Cleveland, O..... 10
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M. D. & L. L. Leggett, Cleveland, O..... 1
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Young & Locke, Titusville, Pa..... 2
John H. McGowan & Co., Cincinnati, O..... 2
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W. F. Thornton, Cleveland, O..... 10

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R. J. Schaeffer & Co., Dayton, O..... 2

Safety Water Columns—
Reliance Gauge Co., Cleveland, O..... 2

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E. C. Atkins & Co., Indianapolis, Ind..... 1

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland, O..... 10

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O..... 10
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E. C. Stearns & Co., Syracuse, N. Y..... 10

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Stearns E. C. & Co., Syracuse, N. Y..... 10
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Tuttle, Oglebay & Co., Cleveland..... 10
Taplin, Rice & Co., Akron, O..... 10
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Young & Locke, Titusville, Pa..... 2

Z

Zucker & Levett Chemical Co., New York... 12

For Sale.

A 6"x10" SELF-INKING Foot Power Printing Press; will do good work. Address J. M., care Iron Trade Review, Cleveland, O. tf

For Sale.

ONE OF DUNN'S HOISTING MACHINES, with over 40 feet of chain. Good as new; capacity, 600 lbs. Address Dunn, care Iron Trade Review, Cleveland, O. tf

Furnace for Sale.

A GOOD Charcoal Iron Furnace, in Michigan For particulars address E. C. Pope, 31 and 32 Wilshire Building, Cleveland, O. tf

For Sale Cheap.

A NEW No. 4 INJECTOR, never been used. Address Jones, care Iron Trade Review, Cleveland, O. tf

For Sale.

WE HAVE RECENTLY PURCHASED the Cleveland Iron Co.'s Rolling Mill plant on Carter street, and have for sale any or all the appliances belonging to the same. Favorable prices will be made to purchasers.
CLEVELAND ROLLING MILL CO.,
Room 12, Nat'l Bank B'ld'g,
Cleveland, Ohio.
Please mention this paper. 12tf

ENGINEERS! Don't be Humbugged.

We guarantee our A. & D. Flue Cleaners to give Steam the most perfect spiral motion entire length of tubes, and do the best work.
CLEVELAND FLUE CLEANER MF'G CO.,
821y 74 Frankfort St., Cleveland, O

Engineers Don't be Deceived.

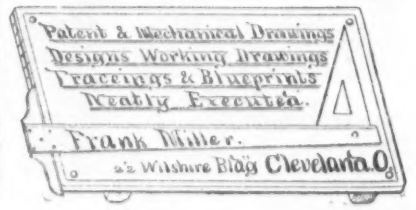
The Cyclone Steam Flue Cleaner is the only Cleaner made giving steam spiral motion the entire length of the tubes
Crescent Mfg. Co., CLEVELAND, O.

JOHN ADT & SON,

NEW HAVEN, CONN.,
BUILDERS OF
Machinery for Straightening & Cutting Wire,
—ALSO FOR—
General Hardware Manufacturing.

QUINT'S AUTOMATIC Steam Engine Governor

for single slide or rotary valve engines. Patented Feb. 22d, 1887. Same can be applied to the ordinary slide valve throttle governor engine converting the engine into an Automatic Cut Off. It has had a practical test on engines running 750 revolutions per minute, and gives the best of results. It is simple and strong in its construction and accurate in its regulation. Address
LEONARD & McCOY, 118 Liberty St., N. Y
93eow26t



Locks, Bolts, etc.

P. & F. Corbear, Locks & Bronze Goods.

Door locks, knobs and latches....dis 60
Escutcheons and keys....dis 60
Padlocks and padlock keys....dis 66⅔
Bell pulls, mineral, porcelain and jet....dis 60
Bell pulls, genuine bronze....dis 60
Lever bell pulls, genuine bronze....dis 60&10
Butts, genuine bronze....dis 60&10
Butts, bronze plated....dis 60&10
Store door locks and latches....dis 60&10
Store door handles....dis 60&10
Shutter hinges & flaps genuine bronze....dis 60&10
Shutter hinges, bronze plated....dis 70
Flush bolts, genuine bronze....dis 70
Shutter knobs, genuine bronze....dis 50
Shutter bars, genuine bronze....dis 60
Sash lifts, genuine bronze....dis 60
Sash pulls and plates, genuine bronze....dis 60
Push plates, genuine bronze....dis 60
Drawer pull genuine bronze....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks....dis 33⅓

Lemon Squeezers.

Porcelain lined....₱ doz $6 00, dis 25&35
Wood....₱ doz $3 00, dis 35
The "Boss"....₱ doz $2.50
Dean's No. 1, ₱ doz $6 50; 2, $3 25; 3, $1 90....dis
Little giant....dis 50

Lines.

Cotton Chalk....dis 40
Silver Lake, Braided, No. 0, $6.00; No. 1, $6.50; No. 2, $7.00; No. 3, $7.50 ₱ gross....dis 25
Masons' Linen....dis 40
Wire Clothes, No 18, $3.75; No 19, $3.25; No. 20 $2.75;....

Mallets.

Hickory....dis 20&10
Lignumvitæ....dis 20&10
Penfield Block Co., Lignumvitæ and Hickory....dis 30

Mattocks.

Regular list....dis 60@60&5

Meat Cutters.

Dixon's (P.S.&W.)	1	2	3	4	
	₱ doz. $14.00	$17.00	$19.00	$30.00	dis 40
Draw Cut Nos.	5	2	6	8	10
Each	$50.00	$75.00	$80.00	$225.00	400.00

dis 20@25

Woodruff's (P S & W) per doz No 100 $15 No 150 $18 dis 45

Hale's—Nos. 11 12 13
$27 $33 $45 dis 70

Enterprise....dis 33⅓

Mincing Knives.

Am. (2d quality), ₱ gro, 1 blade, $7; 2 blades, $12; 3 blades, $18....net
Smith's, ₱ doz. single, $4 50; double, $6 50 dis 40

Money Drawers.

Tucker's ₱ doz....$18 @20

Molasses Gates.

Stebbins' pat....dis 70
Stebbins' genuine....dis 66⅔&10
Stebbins' tinned ends....dis 40&10
Lincoln's pattern....dis 66⅔&10
Scoville....$7 45&10

Nails (wire).

List July 14, 1887....dis 70
Standard Penny Nails, ₱ keg card rate
{ Car lots....$2 60
{ Less than car lots, $2 70

Nuts and Washers.

Size of bolt in	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3½
Hexagon	15¼	11½	8½	6	5¾	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₱ lb add ½c, 1lb boxes add 1c to list

Nut Crackers.

Table (Humason & Beckley Mfg. Co.)....dis 40
Blake's pattern....₱ doz. $2 00, dis 10
Quakenbush....$5 00 net

Oakum.

Government....₱ lb 8 c
U. S. Navy....₱ lb 7¼c
Navy....₱ lb 6½c

Oilers.

Zinc and Tin....new list dis 60&10
Brass and Copper....new list dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₱ doz....dis 10@ 10&10

Packing, Steam.

Boston Belting Co....dis 60
American Packing....10@11c
Russia Packing....16c
Italian Packing....16c

Pencils.

Faber's Carpenters'....high list, dis 50
Faber's Round Gilt....₱ gro $5.25 net

Picks.

Railroad, 5 to 6 lbs....$12 dis 60@60&5
" " 6 to 7 lbs....$13 dis 60@60&5

Pinking Irons.

₱ doz....65c. net

Picture Nails.

Brass head, Sargent's list....dis 50&10&10
Brass head, combination list....dis 50&10
Porcelain head Sargent's list, dis....50&10&10
Porcelain head, combination list....dis 40&10

Plane Irons.

Sandusky Tool C....dis 20&10

Pliers and Nippers.

Button's Patent....dis 40
Hall's Pat. Compound Lever Cutting Nippers, No. 2, 5 in., $13.50; No. 4, 7 in., $21 00 ₱ Doz....dis 20&10@33⅓
Gas Pliers....dis 50&10
Humason & Beckley....dis 50
P. S. & W. Tinners' Cutting Nippers add 6 per cent. dis 10

Plumbs and Levels.

Standard list....dis 70&10
Pocket levels....dis 70&10
Davis' inclinometers....dis 10&10

Post Hole and Tree Augers.

Samson Post Hole Digger..₱ doz. $36.00, dis 20&10
Eureka Diggers....₱ doz. $15 00 @ $16.00
Champion....per doz $9.00
Vaughan's Hollow Tube Post Hole....$12.00 dis40

Potato Parers.

White Mountain....₱ doz $5.00@$5.50
Antrim Combination....₱ doz $8.00
Hoosier....₱ doz $13.50

Pruning Hooks and Shears.

Disston's Combined Pruning Hook and Saw ₱ doz $18.00....dis 25
Disston's Pruning Hook....₱ doz $12.00 dis 25
Pruning Shears....₱ doz 3.75@$4.00 net

Pulleys.

Hot House....discount 60&10
Japanned Screw....discount 60&10
Brass Screw....discount 60&10
Japanned Side....discount 60&10
Japanned Clothes Line....discount 60&10

Pumps.

Cistern, best makers....dis 50@10&60
Pitcher spout, best makers...dis 60&10@60&10&10
Pitcher spout, cheaper goods... dis 70&5@70&10&5

Punches.

Saddlers' or Drive....₱ doz. good quality. 65@75c
Bemis & Call Co.'s Cast Steel Drive....dis 50&5
Bemis & Call Co.'s Springfield Socket....dis 50&5
Solid Tinners....₱ doz. $1.44, dis 55

Rails.

Sliding Door, Wrought Brass....₱ lb 35c dis 20
Sliding Door, Iron, Painted....₱ foot 6c dis 40&10

Rakes.

Cast Steel....dis 65&5
Malleable....dis 65&5

Razors.

J. R. Torrey Razor Co....dis 20
Wostenholme & Butcher....$10 @£....dis 10
Rifle Razor....$9 50 net

Rivets.

Iron, Thousand, list November 17....dis 50
Iron, Ordinary, Cooper's Block and Carriage, list November 17....dis 50
Copper....dis 50

Rods.

Stair. Brass....dis 25&2

Rollers.

Barn door, Sargent's list,....dis 60&10&10
Acme (Anti-Friction)....dis 55

Rope.

Manilla. ½ inch and over....11½c
Sisal, ½ inch and over....11c

Rules.

Boxwood....discount 80@80&10

Sad Iron.

From 4 to 10 lbs....per 100 lbs 3c
Self-heating....₱ doz $9 net
Self-Heating, Tailor's....₱ doz $18 net
Mrs. Potts's Irons....dis 40&10
Enterprise Star Irons....discount 40&10

Sash Weights

Per ton....$22.50@$25.00

Saws.

Disston's Circular....discount 45
Disston's hand panel, rip &c....discount 25
W. M. & C., Champion Regular....per foot 23c
W. M. & C., " Thin Back....₱ ft 24c

Saw Frames.

White, Vermont....₱ gross $12 00
Red, polished & varnished ₱ doz $1.50,....dis 25

Saw Sets.

Aiken's Genuine....$13.00, dis 50 &10
Morrill Saw Sets No. 1 $15.00; No. 3 and 4 $24.00 ....dis 40 &10

Scales.

Hatch, Counter, No. 171....₱ doz $21.00
Hatch, Tea, No. 161....₱ doz $6.75@7 00
Chatillon's Grocers....dis 50
Family Turnbulls....dis 30@30&10
Scale Beams, List of January 12, 1882 dis 50&10

Scrapers.

Adjustable Box Scraper (S. R. & L. Co.) $6.50....dis 30&10
Box, 1 Handle....₱ doz $4.00, dis 10
Foot....dis 50&10

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles dis 65&10
Stanley R. & L. Co.'s Black Handles....dis 60&10
Sets Interchangeable....₱ doz $18.00 dis 25

Screws.

Wood Screws—List Jan 27, 1887.

Flat head iron	dis 70	Extra 10 often given
Round head iron	dis 65	
Flat head brass	dis 65	
Round head brass	dis 60	
Flat head bronze	65	
Round head bronze	60	
Machine, flat head, iron	dis 55	
Machine, round head, iron	50	

Bench and hand—
Bench, iron....25&10
Bench, wood, beech, per dozen $2.25....
Bench, wood, hickory....20 & 10
Hand, wood....20&10
Lag or coach....dis 66⅔@70
Coach, patent gimlet point....66⅔@66⅔&5
Bed....25&5
Hand rail....66⅔&10

Saw Tools.

Atkins' patent....₱ doz sets $6 00

Shears.

American (Cast) Iron....dis 75&10
Pruning....See Pruning Hooks and Shears
Garnard's Lamb Trimmers....₱ doz $4.00
Tinners'....dis 20&2
Seymours List, Dec. 1881....dis 60 &10&5
Seymours Tailor's Shears....dis 33⅓

Scroll Saws.

Lester, complete, $10.00....dis 25
Rogers, complete, $4.00....dis 25

Sheaves.

Sliding Door R. & E. list Dec 18, 1885....dis 55&2
Sliding Door, Patent Roller....dis 60&10&2
Sliding Door, Pat'nt Roller, Hatfield's....dis 70
Sliding Door, Corbin's Anti-Friction Dec. 18, 1885 dis 60&2

Ship Tools.

L. & I. J. White....dis 20 & 5

Shovels and Tongs.

Iron Head....50&10&5
Brass Head....50

Sieves.

Metallic, new list....dis 60&10
Flour sifters { Victor....$2 00 / Hunter....$2 25 / Comet....$1 25

Slates.

School, by case....dis 50&5@50&10

Spoke Shaves.

Iron....dis 30
Wood....dis 30

Spoke Trimmers.

Bonney's....₱ doz $10.00 dis 50
Stearns'....₱ doz $9.00 dis 20&10

Spoons.

Basting Spoons....dis 70&10
Britannia....dis 50
Rogers Bros....dis 50&10

Squares.

Steel and iron, Nickel plated....dis 70@10&75
Disston's try square and T bevels....dis 45
Winterbottom's try and miter....dis 30&10

Steelyards.

dis 40&10@50

Stocks and Dies.

Blacksmith's....dis 35
"Lightning" screw plate....dis 10

Stone.

Hindostan, No. 1, 6c; Axe, 4½c; Slips 9c
Washita Stone....No. 1, ₱ lb 20
Turkey Oil Stone....4 to 3 in....₱ lb 40c
Turkey Slips....$1.00@1.50
Washita Slips No 1....₱ lb 37@38
Washita No 2 stone....₱ lb 15c
Arkansas Stone....2.00

Stove Boards.

Zinc....70
Oxidized....45

Shovels and Spades.

Ames' list Nov 1 1885....discount 20
Dennis....5.50
Hussey & Binns, rail road....8.00

Stove Polish.

Joseph Dixon's....₱ gross $6 00 dis 10
Gem....₱ gross 4 50 dis 10
Gold medal....₱ gross 6 00 dis 25
Rising Sun....₱ gross $5 50 net
Dixon's plumbago....₱ lb 8c. net

Trowels.

Lothrops' Brick and Plastering....dis 25
Reed's Brick and Plastering....dis 25
Disston's Brick and Plastering....dis 25
Brade's brick....dis 20

Tacks, Brads, &c.

New List, September 1, 1882. & Supplement Jan-1, 1886.

American iron carpet tacks all kinds dis. 72½&10
Steel carpet tacks all kinds....72½&10
Swedes Iron carpet tacks all kinds....72½&10
Swedes iron tacks....67½&10
Swedes iron Upholsterers' tacks....67½&10
Tinned Swedes iron tacks....67½&10
inned Swedes iron Uphclsterers' tacks....67½&10
American iron cut tacks....70&10
Copper tacks....33⅓&10
Copper finishing and trunk nails....33⅓&10
Cigar box nails....45&10
Finishing nails....60&10
Hungarian nails and miners' tacks....60&10
Gimp and lace tacks....67½&10
" " " tinned....67½&10
Trunk and clout nails....60&10
Tinned trunk and clout nails....60&10
Basket nails....60&10
Chair nails....60&10
Common and patent brads....60&10
Tinned capped trunk nails....60&10

Tinware.

Stamped, Japaned & Pieced. list Jan 20, 1887....dis 70&10

Tobacco Cutters.

Enterprise Mfg. Co (Champion)....dis 20&10@30

Traps.

Game, Newhouse....dis 35
Victor....60&10
Wood, mouse....15c ₱ doz holes
Delusion, mouse....₱ gross $18 00 dis 15

Trammel Lifters.

Wollensak's Patent....dis 50

Twine.

	BC.	P.
No. 12, Flax Twine, ¼ and ½ lb Balls	21½c	27c
No. 18, " " ¼ and ½ "	21½c	27c
No. 36, " " ¼ and ½ "	20c	25c
2-Ply Hemp, ¼ and ½ lb Balls (Spring Twine)	17	
3-Ply " 1 lb Balls	17½c	
3-Ply " 1½ lb Balls	16c	

Cotton Wrapping, 5 Balls to lb....15@16c

Vises.

Solid box....50&10&5@60
Parker's....discount 20@25
Prentiss...." 20 &5@25
Stephen's...." 25
Saw Filers, Wentworth's....dis 20&10
Saw filers, Stearn's....33⅓&10

Washer Cutters.

Smith's Patent....₱ doz $12 00, dis 20&10&10
Johnson's....₱ doz $11 00, dis 33⅓
Penny's....₱ doz Pol. $14 00; Jap'd. $16 00, dis 55
Appleton's....₱ doz $16 00, dis 60&10
Bonney's....dis 30&10

Well Wheels.

8 in., $2.00; 10 in., $2.50; 12 in., $3.25

Wire. New List Jan. 18. 1884

Brass and Copper....discount 20
Bright and annealed, Nos. 0 @18....dis 70&5@72½
" " Nos. 19 @ 26....dis 72½@75
" " Nos. 27 @ 36 dis 75@75&10
Coppered Nos. 0 to 18, market list....dis 65&10@70
Galvanized Nos. 0 to 18 " " dis 60&7½@65
Tinned market Nos. 0 to 18,....dis 65
Cast steel....dis 50
Tinned Broom Wire....dis 70@72½
Annealed Fence, Nos. 8 and 9....dis 75
Annealed Grape, Nos. 10 to 14....dis 75
Stubs Steel Wire regular....$6 00 @ lb dis 30

Wrenches.

Coe's genuine, cash in 10 days....55 & 3
Girard Standard....discount 70&10
Agricultural....discount 75&10
Mechanics'....dis 55&10 & 3
Bemis & Call's Combination....25&10
Donohue's Engeneers'....25

TINNERS' STOCK.

Tin.

Banca, Straits, English, Bar.... { Market excited and advancing. Quotations only on application.

Spelter.

American, cash, ₱ lb....

Charcoal Tin Plate.

IC 12x12 225 sheets....$6 00@6 50
IX 14x20 112 sheets....7 25@8 00
IC 10x14 225 sheets....₱ box 5 75@6 25
IC 20x28 112 sheets....12 25@14 00
IX 10x14 225 sheets....7 25@8 00
IX 12x12 225 sheets....7 75@8 25
For each additional X add $1.90@3.00

Coke Tin Plate.

	Best	Ordinary
IC 10x14 / IC 14x20	$5 60	

Solder.

Half and Half, in bars warranted, No. 1, Refined, Bingham.... { Quotations only application.

Zinc.

inc. cask....6¼
inc. open....6¾

LEAD.

Pig....5
Bar. ₱ lb....6
Pipe. ₱ lb....5½c. net
Sheet. ₱ lb....6 net
Chilled Shot ₱ bag 25 lbs....1 35

BABBIT METAL.

No. 4....6
Allens....9¼
Excelsior....15
W. B. Genuine....25

COPPER.

Lake Ingot....17
Arizona....15¾

IRON AND STEEL.

Flat Bar

1½ to 4 by ⅝ to 1 inch....1 75
4½ to 6 by ⅝ to 1 inch....1 85
1¾ to 6 by 1¼ to 2 inch....2 15
1¼ & 1⅜ by ⅝ to ¾....1 85
1 & 1⅛ by ⅝ to ¾....1 85
⅝, ¾ and ⅞ by ⅝ to ¾....2 15

Round and Square.

1 to 1¾ inch....1 75
2 to 2⅝....1 95
2¾ to 3¼ inches....2 25
3⅜ to 4....2 75
4¼ to 4½....3 25
4¾ to 5....3 45

Oval.

⅜ to 1¼ inch....2 15
⅝ to ¾....2 35
½....2 55
⅝....2 95

Half Oval and Half Round.

1¼ to 3 inch....2 85
⅜ to 1¼....2 45
⅝ to ¾....2 95
½....3 25
⅝....4 75

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch....1 95
1 to 1⅝ by ¼ and 5-16 inch....2 05
¾ to ⅞ by ¼ and 5-16 inch....2 25
⅛ to ⅝ by ¼ and 5-16 inch....2 75

Hoops.

1¼ to 4, Nos. 13 to 15....2 55
1¼ to 2, Nos. 16 to 18....2 65
1¼ to 2, No. 19....2 75
1¼ to 2, No. 20....2 85
1¼ to 2, No. 21....2 95
1¼ to 2, No. 22....3 05
15-16, 1 and 1⅛, Nos. 13 to 15....2 75
15-16, 1 and 1⅛, Nos. 16 to 18....2 65
15-16, 1 and 1⅛, Nos. 19 and 20....2 95
15-16, 1 and 1⅛, No. 21....3 05
15-16, 1 and 1⅛, No. 22....3 25
⅞, Nos. 13 to 15....2 95
⅞, Nos. 16 to 18....3 05
⅞, Nos. 19 and 20....3 15
⅞, No. 21....3 25
⅞, No. 22....3 35
13-16, Nos. 13 to 18....3 15
13-16, Nos. 16 to 18....3 25
13-16, Nos. 19 and 20....3 35
13-16, No. 21....3 45
13-16, No. 22....3 55
¾, Nos. 13 to 15....3 25
¾, Nos. 16 to 18....3 35
¾, Nos. 19 and 20....3 45
¾, No. 21....3 55
¾, No. 22....3 65
11-16, Nos. 13 to 15....3 45
11-16, Nos. 16 to 18....3 55
11-16, Nos. 19 and 20....3 65
11-16, No. 21....3 75
11-16, No. 22....3 85
⅝, Nos. 13 to 15....3 65
⅝, Nos. 16 to 18....3 85
⅝, Nos. 19 and 20....3 95
⅝, No. 21....4 05
⅝, No 22....4 15
⅝, No 23....4 25

Light Band

1¼ to 6 by ¼ to 3-16 in....2 25
1½ to 6 by Nos 11 and 12....2 35
1 to 1¾ by ¼ to 3-16 in....2 35
1 to 1¾ by Nos. 11 and 12....2 45
⅞ and 13-16 by ½ to 3-16 in....2 65
⅞ and 13-16 by Nos. 11 and 12....2 75
¾ and 11-16 by ½ to 3-16 in....2 95
¾ and 11-16 by Nos. 11 and 13....3 05
⅝ and 9-16 by ¼ to 3-16 in....3 25
⅝ and 9-16 by Nos. 11 and 12....3 30
½ by ¼ to 3-16 in....3 50
½ by Nos. 11 and 12....3 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12....2 75
⅞ inch, " " " 13 and 14....3 05
¾ inch, " " " 11 and 12....3 05
¾ inch, " " " 13 and 14....3 25

Sheet Iron.

No. 10 to 14....2 45
No. 15 to 17....2 65
No. 18 to 21....2 75
No. 22 to 24....2 85
No. 25 to 26....2 95
No. 27....3 05
No. 28....3 25

Iron Boiler Plates.

Tank, ¼ inch and heavier....2 45
C No. 1, " 2 70
C H No. 1, " 2 95
C H Flange, " 3 65
Extra Flange, " 4 05
Solid Fire Box, " 4 95

Steel Boiler Plates—1-4 in. and heavier.

Tank....$2 55
Shell....$3 05
Flange....$3 30
Marine Flange....$3 80
Fire Box....$4 45

Above includes plates 90 inches wide.
90 to 96 in. wide....½c. lb extra.
96 to 100 in. wide....1 c. "
100 to 104 in. wide....1½c. "
104 to 116 in. wide....special.

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON. cts. lb

to 2 in. inclusive....09
9-16 to ½ in. " 09
7-16 to ⅝ and 2½ to 3 in....10½
3½ to 4 in....10
⅜ to 11-16 an 4½....11¼

TRAVELER'S RECISTER.

Standard Time.
Revised March 6th, 1888.

N. Y. C. & St. L. R. R. Co.— "The Nickel Plate."

EASTWARD.	ARRIVE.	DEPART
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	
Local Freight	4 40 p m	5 45 a m
WESTWARD.	ARRIVE.	DEPART.
Chicago Passenger		6 30 a m
Fostoria Passenger	4 46 p m	4 51 p m
Local Freight	5 20 p m	5 50 a m

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.
Euclid Accommodation departs 6:24 a. m. 12:10 a. m., 5:45 p. m.
All trains daily, except Sunday.

Cleveland & Pittsburg.

	ARRIVE.	DEPART.
New York Express	12 45 p m	7 45 a m
New York Express	6 55 p m	1 40 p m
Alliance & Akron Accom.	9 35 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	* 5 25 a m	*11 10 p m

*Daily; all other trains daily except Sunday.

Mt. Vernon & Pan Handle Route

C., A. & C. Ry. Co.	ARRIVE.	DEPART.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col & Cin. Night Express	7 30 a m	8 00 p m
Akron & Columbus Exp.	12 45 p m	1 40 p m
Akron & Orrville Accom.	9 35 a m	3 25 p m

The 8 p. m train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily except Sunday.

Erie Railway.
Depot. South Water St. and Viaduct.

	ARRIVE.	DEPART.
N. Y. & Pitts. Express	15 58 a m	*8 25 a m
Fast N. Y. & Pitts. Express.	*10 55 a m	*3 00 p m
Mahoning Accommodation		†6 40 a m
Pittsburgh Express	† 6 25 p m	
Youngstown Local	†8 05 a m	
Mahoning div. and Pitts Local		*11 40 a m
Mahoning Val Accom		*4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	

* Daily. † Daily except Sunday. ‡ Daily except Monday.

Lake Snore & Michigan Southern Railroad.

TRAINS GOING EAST.	Arrive from West.	Depart East.
No. 4, Fast Limited Ex	2 55 a m	*2 55 a m
No. 6, N. Y. & Bos. Ex	*1 35 a m	*1 40 a m
No. 8, N. Y. B't'p & At Ex	*8 25 a m	*8 50 a m
No. 26, Elyria Accom	†7 45 a m	
No. 10, Toledo & Sandusky Accommodation	†1 05 a m	
No. 24, Buffalo Accom		†7 00 a m
No. 10, N. Y. & Boston "Flyer,"		*11 50 a m
No. 12, N. Y. & Bos. Ex.	*2 35 p m	*3 00 p m
No. 2 Night Express	†9 40 p m	†10 00 p m
No 26, Conneaut Accom		†4 25 p m
TRAINS GOING WEST.	Arrive from East.	Depart West.
No. 1, Fast Limited Ex	*12 15 a m	*12 15 a m
No. 23, Cleveland Express	*2 15 a m	
No. 3 Chi. Ex. via Sand'y	15 30 a m	†5 45 a m
No. 25, Mich. Ac. via Norw'k		†5 45 a m
No. 21, Toledo Ex. via Norwalk and Sandusky	†12 50 p m	†3 20 p m
No. 5, Fast St. Louis & Chicago Ex. via Sandusky	*10 50 a m	*10 55 a m
No. 9 hi. Pac. Ex. via Nor'k	*6 55 p m	*7 15 p m
No. 31, Elyria Accommodation, to Elyria only		†4 30 p m
No. 27, Conneaut Accom	†8 10 a m	

Sunday train for Nottingham— Depart 8:15 a. m. and 1:00 p. m.; arrive 9:20 a. m. and 4:45 p. m.
Reference marks—*Daily. †Daily except Sunday. ‡Daily except Monday.
A local Cleveland and New York Sleeper and dining car daily on No. 10, leaving Cleveland at 11:50 a. m., arrives Grand Central Depot, New York 7:30 a. m.
For further information as to trains, connections and sleeping car berths apply at the City Ticket Office 229 Park St., Mercantile Bank building. Telephone 669.

M. E. GAUL, City Pass. Ag't. A. J. SMITH, Gen'l Pass. & Ticket Ag't.

Cleveland and Canton Railroad.

Arrive.—Canton, Sherrodsville and Coshocton 9 55 a.m., 7 00 p.m.
Kent—*7 50 a.m., *7 16 p.m.
Bedford—*7:50 a.m., 1:06 p.m., 7 16 p.m.
Newburgh and Miles avenue—7:10 a.m., 4:15, p.m. 5:33 p.m.
Depart—
Canton, Sher'dsville & Cosh't'n—7:00 a.m. and 3:10 p.m.
Kent—*8:38 a.m. and *8:30 p.m.
Bedford—*8:38 a.m., 4:45 p.m., 11:10 a.m., 5:45 p.m.
Newburgh and Miles Avenue—6:12 a.m., 2:00 p.m., 4:40 p.m.
Trains marked with * run daily. All others daily except Sunday.
Depot at Ontario street, one block east of Huron street

Cleveland, Lorain and Wheeling.

	DEPART.	ARRIVE.
Wheeling Express	6 45 a m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

Pittsburgh & Lake Erie Railroad.

On and after Jan. 2 1888, passenger trains will depart from and arrive at the Pittsburgh and Lake Erie Depot at Pittsburgh, as follows, Central time:

P. & L. E. R. R. Depart for—
No. 1, Cleveland, Bradford and East, 5 25 a.m
No. 5, Buffalo, St. Louis, Cleveland, 7 45 a.m
No. 5, Beaver Falls Accommodation, 8 40 a.m
No. 7, Buffalo, New York, and all New England points, 10 15 a.m
No. 9, Chicago, Cincinnati, St. Louis, 1 10 p.m
No. 11, Buffalo Express, 3 30 p.m
No. 13, Beaver Falls Accommodation, 5 20 p.m
No. 15, Buffalo Express, 10 30 p.m

Arrive from—
No. 2 Beaver Falls Accommodation, 5 25 a.m
No. 4, Buffalo and Cleveland Night Exp. 6 55 a.m
No. 6, Youngstown Accommodation, 9 20 a.m
No 8 Beaver Falls Accommodation, 12 40 p.m
No. 10, Chicago, Cincinnati & St. Louis, 1 35 p.m
No. 12, Buffalo Express, 5 45 p.m
No. 14, Cleveland & Buffalo Express, 8 05 p.m
No. 14, Cleveland & Buffalo Express, 10 35 p.m
Pittsburgh & Lake Erie trains Nos. 4, 15, 8 and 10 daily.

E. HOLBROOK, General Superintendent.
R. W. JONES, Master of Transportation.
A. D. SMITH, Gen'l Pass. Ag't. Pittsburgh.

WHEELING & LAKE ERIE

TIME TABLE—IN EFFECT JAN. 8, 1888.
Central Standard Time.

EASTWARD.	No. 5.	No. 7.	No. 9.*	No 13*
Toledo lv	7 45 AM	1 10 PM	4 50 PM	7 45 PM
Oak Harbor ar	8 41	2 05	5 45	10 0
Fremont	9 06	2 30	6 10	1 45
Clyde	9 22	2 47	6 25	11 15
Bellevue	9 37	3 03	6 40	11 40 PM
Monroeville lv	9 55	3 20	6 8	3 10 AM
Norwalk	10 10	3 40	7 15	3 22
Wellington	11 00	4 32	8 08	4 00
Creston	11 53	5 20	9 05 PM	4 47
Orrville ar	12 20 PM	5 48	9 40 PM	5 15*
Orrville lv	12 40	5 53	7 05 AM	7 05
Massillon ar	1 20	6 35	7 52	7 52
Massillon lv	1 20	6 35	7 52	7 52
Navarre	1 35	6 50	8 10	8 10
Valley June. lv	2 20	7 35	8 55	8 55
New Cumberl'd	2 23	7 48	9 10	9 10
Sherrodsville	2 45	8 00	9 25	9 25
Leesville	2 52	8 08	9 40	9 40
Bowerston ar	2 58 PM	8 15 PM	9 50 AM	9 50 AM
Canal Dover	3 57 PM			
New Comerst'n	3 18			
Cambridge	4 35			
Macksburg	6 02			
Marietta ar	7 15 PM			

WESTWARD.	No. 6.	No. 8.	No. 4.	No. 2.*
Marietta lv	6 45 AM	2 20 PM		
Macksburg	7 58	1 30		
Cambridge	9 25	3 00		
New Comerst'n	10 23	3 58		
Canal Dover	11 04 AM	4 34 PM		
Bowerston	1 25 AM	3 45 PM	5 55 AM	
Leesville	11 32	3 55	6 02	
Sherrodsville	11 40	4 10	6 10	
New Cumberl'd	11 52	4 25	6 22	
Valley June	12 20 PM	5 02	6 45	
Navarre	12 50	5 35	7 35	
Massillon	1 05	5 50	8 00	
Orrville ar	1 40	6 25	8 55	
Orrville lv	1 45	6 35*	9 13	
Creston lv	2 18	7 02	9 42	
Wellington	3 05	7 43	10 33	
Norwalk	3 55	8 25	11 30	7 25 AM
Monroeville	4 07	8 35	11 45	7 35
Bellevue	4 23	9 45	11 59	7 51
Clyde	4 39	10 00	12 15 PM	8 06
Fremont	4 55	10 17	12 30	8 23
Oak Harbor	5 20		12 53	8 45
Toledo ar	6 20 PM	11 15*	1 50 PM	9 40 AM

No. 27	No. 25	Huron Divis'n.	No. 26	No. 28
4 50 PM	7 40 AM	Ar. Huron Lv	8 55 AM	5 30 PM
4 32	7 22	Friese Landing	9 10	5 45
4 20	7 10	Milan	9 28	6 03
Lv 3 55	Lv 6 45	Norwalk	Ar 9 55	Ar 6 30
Ar PM	Ar AM		Lv AM	Lv AM
		Monroeville		

* Daily.
Train No. 13 leaves Toledo *7 45 p. m.; arrive Monroeville 12 15 a. m and Norwalk 12 35 a. m
This road is now open through from Toledo to Bowerston, connecting with the Pennsylvania System for all points East.

THROUGH CAR SERVICE.
Between Toledo, Cambridge and Marietta.
" " and Bowerston.
" " and Akron, Youngstown and Pittsburgh.
" Chicago, Akron, Youngstown and Pittsburgh.

M. D. WOODFORD, Gen'l Manager. JAMES M. HALL Gen'l Pass. Agt.

Scioto Valley Railway

TIME TABLE.
In effect May 27, 1888.
THE SHORT LINE TO ALL POINTS
North and South, East and Southeast, West and Northwest.

TRAINS GOING SOUTH

STATIONS.	No. 2.	No. 4.	No. 6.
Columbus Lv	7 10 a.m	11 25 a.m	5 25 p.m
Valley Crossing	7 30 "	11 44 "	5 45 "
Lockbourne	7 41 "	11 53 "	5 56 "
Ashville	7 55 "	12 07 p.m	6 10 "
Circleville	8 15 "	12 26 "	6 30 "
Kingston	8 34 "	12 44 "	6 49 "
Chillicothe	9 01 "	1 30 "	7 35 "
Sharon	9 36 "	2 05 "	8 10 "
Waverly	9 46 "	2 14 "	8 20 "
Piketon	9 58 "	2 27 "	8 33 "
Big Run	10 12 "	2 41 "	8 47 "
Lucasville	10 27 "	2 57 "	9 03 "
Portsmouth	10 50 "	3 20 "	9 25 "
Sciotoville	11 05 "	3 35 "	9 40 "
Wheelersburg	11 10 "	3 40 "	9 45 "
Haverhill	11 29 "	3 59 "	10 04 "
Hanging Rock	11 40 "	4 10 "	10 15 "
Ironton	11 50 "	4 20 "	10 25 "
Petersburg	12 00 m.	4 30 "	10 35 "
Ashland Ar	12 30 p.m	5 00 p.m	11 05 p.m

Trains Nos. 2 and 4 daily, except Sunday.
Train No. 6 daily.
Train No. 6 takes supper at Chillicothe.

TRAINS GOING NORTH.

STATIONS.	No. 1.	No. 3.	No. 5.
Ashland Lv	2 45 a.m	9 05 a.m	5 35 p.m
Petersburg	3 15 "	9 35 "	6 05 "
Ironton	3 26 "	9 46 "	6 15 "
Hanging Rock	3 36 "	9 56 "	6 25 "
Havernill	3 46 "	10 07 "	6 36 "
Wheelersburg	4 06 "	10 28 "	6 55 "
Sciotoville	4 12 "	10 33 "	7 00 "
Portsmouth	4 27 "	10 05 "	7 15 "
Lucasville	4 49 "	11 14 "	7 37 "
Big Run	5 04 "	11 32 "	7 53 "
Piketon	5 18 "	11 48 "	8 07 "
Waverly	5 30 "	12 01 p.m	8 20 "
Sharon	5 40 "	12 11 "	8 30 "
Chillicothe	6 35 "	1 10 "	9 06 "
Kingston	7 01 "	1 26 "	9 31 "
Circleville	7 20 "	1 36 "	9 49 "
Ashville	7 40 "	1 55 "	10 08 "
Lockbourne	7 55 "	2 15 "	10 22 "
Valley Crossing	8 06 "	2 39 "	10 31 "
Columbus Ar	8 20 a.m	3 00 p.m	10 50 p.m

Train No. 1 daily.
Trains Nos. 3 and 5 daily, except Sunday.

COUPON TICKETS, by the best routes and to all principal points in the United States and Canada, can be found at the following Stations: Columbus, Circleville, Kingston, Chillicothe Waverly, Portsmouth, Ironton, A. C. & I. Ashland.
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RAILROAD.
THE POPULAR ROUTE
BETWEEN THE
NORTH and SOUTH
THE DIRECT ROUTE TO OR FROM
FORT WAYNE,
INDIANAPOLIS,
TERRE HAUTE,
EVANSVILLE,
AND ST. LOUIS.

13 MILES SHORTER —BETWEEN— **13**
Fort Wayne and Indianapolis
Than any other Route.

22 MILES SHORTER AND QUICKER **22**
By 3 HOURS, Between
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The Picturesque Lehigh Valley Route.

Two through trains with Pullman cars attached are now run via by this beautiful scenic route, between Suspension Bridge, Buffalo, New York and Philadelphia, leaving Suspension Bridge 8:35 A. M. and 3:40 P. M., Buffalo 9:15 A. M. and 5:15 P. M., connecting with all trains from the West.

Passengers between the East and West passing over the famed LEHIGH VALLEY ROAD will experience the pleasure of a trip through the most magnificent and picturesque scenery in the world, presenting an ever varying panorama of delightful surprises.

Double track, steel rails, magnificent road bed and unrivaled equipment, all combine to make the LEHIGH VALLEY the favorite and most desirable route between the East and the West.

Anthracite Coal is used entirely, guaranteeing the passengers perfect freedom from the dense volumes of smoke that so greatly annoy passengers on lines using Bituminous Coal.

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Gen'l Pass. Agent Bethlehem, Pa.

Expiration Registers.

MANUFACTURERS' and Dealers' Insurance Registers with special ruling for number of Policy, Company, seven spaces for amounts on different property, amount of policy, amount of premiums, time of expiration, etc., will be sent post-paid on receipt of $1.00. Or we will give one as a premium with each new subscription to the IRON TRADE REVIEW, price $3.00 per year.

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Week Days **FOR DETROIT** 9.00 P. M.

Special Sunday Night and Thursday Morning Trips, July and August.

Four Trips **For Mackinac** per Week,

and Lake Huron Way ports.

All Departures from 23 River Street.

E. B. WHITCOMB, G. P. A. T. F. NEWMAN, G. A

VALLEY RAILWAY.

Depot foot South Water Street

	Arrive.	Depart.
Valley Junction Mail	*7 30 a m	*7 20 p m
Marietta Express	†11 00 a m	†5 50 p m
Canal Dover Express	* 4 30 p m	*10 00 a m
Akron & Cleve. Accom	* 7 45 p m	*7 45 a m

*Daily.
†Daily. except Sunday.

WM. THORNBURGH, Gen. Manager. R. A. CARRAN, Gen. Pass. Ag't.

THE FAVORITE ERIE RAILWAY AND Picturesque Route TO New York, Boston and the East.

THE SHORTEST AND QUICKEST ROUTE TO PITTSBURGH, WASHINGTON AND BALTIMORE, AND THE SOUTHEAST.

Change of time goes into effect May 20, 1888.
Central, or Ninetieth Meridian time, 33 minutes slower than Cleveland city time.
Until further notice trains will leave from the New Central Depot, South Water Street and Viaduct, as follows:

	Depart.
No. 62, Mahoning Valley Accommo	† 6 40 a m
No. 72, New York Express,	* 8 30 a m
No. 72, Fast Pittsburgh Express	* 8 30 a m
No. 64, Fast New York Express	* 3 00 p m
No. 64, Pittsburgh Express,	* 3 00 p m
No. 66, Youngstown Accommo	* 5 00 p m
No. 68, Pittsburgh Express	†11 10 p m
No. 68, New York Express	†11 10 p m
No. 70, Pittsburgh Local Express	*11 40 a m
No. 74, Shenango Valley Express	† 4 00 p m
	Arrive.
No. 73, Shenango Valley Express	† 9 23 a m
No. 61, New York Express	† 5 45 a m
No. 61, Pittsburgh Express	† 5 45 a m
No. 65, Fast New York Express	*10 55 a m
No. 65, Pittsburgh Express,	*10 55 a m
No. 67, Pittsburgh Express	† 1 20 p m
No. 63, New York Express	* 7 05 p m
No. 69, Pittsburgh Express	* 8 40 p m
No. 77, Youngstown Local	* 7 25 a m
No. 13, Erie Express, carrying express matter only, from all points East and South-east, carries no passengers (except Monday)	† 1 20 p m

* Daily † Daily, except Sunday.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City and intermediate points without change. No change to Boston and New England cities.
Baggage checked through to all points East.
Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Central Depot, South Water street and Viaduct, Cleveland. Ship by Erie Express.

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M. L. FOUTS, City Passenger Agent. 141 Superior Street, Weddell House, Cleveland, O.

Cleveland & Marietta R. R.

THROUGH LINE BETWEEN
Marietta, Caldwell, Cambridge, Newcomerstown, Canal Dover, Canton, Akron, Cleveland, Buffalo, Toledo Pittsburgh, New York, Coshocton, Newark, Zanesville, Columbus, Chicago and St. Louis.

In effect April 22d, 1888.

GOING NORTH.			GOING SOUTH.	
No. 4.	No. 2.	STATIONS.	No. 1.	No. 3.
9 55 AM	2 00 AM	Parkersburg	2 45 PM	1 55 AM
12 20 PM	6 45	Marietta	10 15 AM	7 13
12 49	7 05	Caywood	9 55	6 53
12 46	7 11	Stanley	9 49	6 47
1 00	7 25	Whipple	9 35	6 32
1 10	7 35	Warner	9 25	6 22
1 23	7 48	Elba	9 12	6 09
1 30	7 55	Macksburg	9 05	6 02
1 37	8 01	Dexter City	8 58	5 55
1 41	8 05	South Olive	8 54	5 50
1 48	8 12	Dudley	8 47	5 43
1 57	8 20	Caldwell	8 40	5 36
2 07	8 30	Belle Valley	8 30	5 26
2 17	8 40	Ava	8 19	5 16
2 29	8 52	Pt. Pleasant	8 07	5 04
2 42	9 04	Byesville	7 53	4 50
3 00	9 25	Cambridge	7 36	4 35
3 07	9 32	Oldham's	7 27	4 27
3 14	9 40	Miller's	7 20	4 20
3 24	9 50	Kimbolton	7 10	4 10
3 39	10 05	Guernsey	6 56	3 55
3 47	10 12	Post Boy	6 49	3 47
3 58	10 23	N. Comerstown	6 40	3 38
4 05	10 30	Wolf's	6 31	3 29
4 17	10 43	Phillipsburg	6 20	3 17
4 22	10 48	Black Band	6 14	3 12
4 28	10 54	Turner's	6 09	3 06
4 38	11 04	Canal Dover	6 00 AM	2 57
5 00	11 27	ar. Vall'y J'n. lv		2 35
5 02	11 35	lv. Vall'y J'n. ar		2 20
	12 19 PM	Canton		1 30
	1 12	Akron		12 31
	2 36	Cleveland		11 20 A
	8 00	Buffalo		5 40
11 15 PM	6 20	Toledo		7 05

Train No. 8 leaves Marietta at 1 40 p. m. Whipple 2 40, Warner 3 00, Elba 3 20, Macksburg 3 35, Dexter City 3 47, Caldwell 4 25, arriving Cambridge 6 30 p. m. Train No. 5 leaves Valley Junction at 5 15 p. m., arriving at Canal Dover 5 35 p. m.
Through coaches on trains Nos. 2 and 3 between Marietta, Canton, Akron, Cleveland and Toledo. Close connections made at Marietta with C., W. & B., M., C. & N., Z. & O., and Ohio River Packets; at Cambridge with B. & O., east and west; at Newcomerstown with P., C. & St. L., east and West; at Canal Dover with C., L. & W and C. & P., north and east; at Valley Junction with W. & L. E. and Valley R'y.

A. T. WICKOFF, Gen. Manager. W. K. RICHARDS, Gen. Pass. Agt

½ to 6 in.	11½
¼ to 9-32 and ⅜ to 7 in.	12
3-6 in.	14

Flats.

	cts. lb
2 to 9-16 wide by 2 to ⅝ thick	0

Bessemer and O. H. Steel.

	cts. lb.
Machinery	base price. 02¾
Tire	" 02¾
Spring	03¼
Sleigh Shoe	02¾
Toe Calk	03
Cutter Shoes, tapered and burr	03

For extra sizes, see classification below.

Machinery Steel.

ROUNDS AND SQUARES.

	cts. per lb ex.
1 to 3 in. incl.	base
3⅛ to 4 "	0.3
4⅛ to 6 "	1.0
⅜ to 15-16 "	0.2
¼ to 11-16 "	0.3
⅛ to 7-16 "	0.4
5-16 to 11-32 "	0.5
¼ and 9-32 "	0.7
Machine cutting, specified lengths, ab'e 24 in.	0.2
Machine cutting, specified lengths, 12 to 24 in.	0.4

Machine cutting to specified lengths less than 12 inches, according to contract, but not less than 0.6 cents on each size extra. Sawing, one-half of the above extra for cutting.

FLATS. cts. per lb ex.

1½ to 6 in., by 5-16 to 1 in. thick	base
1½ to 6 in., by ¼ and 9-32 in. thick	0.2
1¼ to 6 in., by 3-16 and 7-32 in. thick	0.3
1¼ to 6 in., by ⅛ and 5-32 in. thick	0.4
¾ to 1 7-16 in., by ¼ to 1 in. thick	0.3
⅜ to 1 7-16 in., by 3-16 and 7-32 in. thick	0.4
⅜ to 1 7-16 in., by ⅛ and 5-32 in. thick	0.5
⅜ to 11-16 in., by ¼ to ½ in. thick	0.4
⅜ to 11-16 in., by 3-16 and 7-32 in. thick	0.6
⅜ to 11-16 in., by ⅛ and 5-32 in. thick	0.8
⅝ to ¾ in., by 1-16 and 3-22 in. thick	2.0
13-16 to 1¼ in., by 1.16 and 3-32 in. thick	1.5
1¼ to 3 in., by 1-16 and 3-32 in. thick	1.0

These extras apply on Tire, Toe-Calk, Shoe and Flat Machinery Steel, also on Cutter Shoes.

SPRING STEEL FLATS. cts. ex.

1¼ to 4 in. by No. 4 gauge to ⅛ in. inclusive,	base
1 and 1¼ in. by No. 1 gauge to 4 gauge "	0.2
1 to 3 in. by No. 5 gauge to 7 gauge "	0.5
⅞ to 3 in. by No. 8 gauge to 10 gauge "	1.0
⅜ to 3 in. by No. 11 gauge to 16 gauge "	2.0
⅜ to 3 in. by No. 17 gauge to 20 gauge "	3.5
⅜ to ⅝ in. by No. 10 gauge to 16 gauge "	4.0
⅜ to ⅝ in. by No. 17 gauge to 20 gauge "	5.0
⅜ to ⅝ in. by No. 21 gauge to 24 gauge "	6.0

Bessemer and Open Hearth cut to length, 24 nch and over 1-10 cent per lb. extra, and under, y special contract.

ROUND SPRING STEEL. cts. ex

⅝ to 1¼ inches	base
⅛ to 9-16 inches	0.2
⅜ to 7-16 inches	0.5
5-16 inches	1.0
¼ inches	1-5

English Tool Steel.

Jessops	16c
Hob on's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

⅛, ⅜, 11-16 and ¾ inches diameter	4 00
Bridge ⅛, ⅜, 11-16 and ¾ inch diam	4 00

Rolls and Castings.

Furnace floor and straightening plates	1¼c
Housings and castings not otherwise specified	1¾c
Guide plates	2½c
Spindles and coupling boxes	1¾c
Sand rolls and pinions, large size	2 c
Sand rolls and pinions, small size	2½c
Pipe mill castings	3 c
Rolling mill castings under 50 lb	2 c
Spur and bevel wheels, large	3 c
Spur and bevel wheels, small	3½c
Pulleys up to 30 inches	4 c
Pulleys over 30 inches	3½c
Engine castings, light	3½c
Engine castings, heavy	2½c

SCRAP IRON AND OLD METAL

	Net Ton.
No. 1 R. R. wrought scrap	$23 00
No. 1 wrought scrap	20 00
No. 1 Machine cast scrap	15 00
Stove plate (free from burnt iron)	10 50
Grate bars	11 00
Pipes and flues (Clean)	13 00
Tank iron	12 50
Hoop and band iron	10 00
Iron axles	28 00
Light sheet iron	10 00
Axle turnings	16 00
Wrought turning (free from cast)	15 00
Wrought iron, oily drillings	14 00
Cast borings	11 00
Malleable iron	10 50
Uncut wrought iron boilers	10 00
Steel boiler plates	14 50
Old iron T rails	gross tons $27 00
Old steel rails	23 00
Car wheels	20 00
Old copper	per lb 7
No. 1. H. red Brass	8½
Heavy yellow brass	6½
Light yellow Brass	6
Scrap Zinc	3
Tea Lead	3
Heavy Lead	3¼

WROUGHT IRON PIPE.

DISCOUNTS.

	Discount Per Ct.
Wrought iron pipe: Butt black X str	52½
XX str	
Wrought iron pipe: Lap black X str	52½
XX str	
Wrought iron pipe: Butt galv	42½
" " Lap "	52½
Lap-welded boiler tubes	50
" drive pipe	
" casing	
Lead pipe per lb	
Sheet lead "	
Galvanized spiral pipe	50
" " fittings	30
Patent adjustable ells	40
Globe ventilators	60
Tin tubing	50
Fittings for same	30
Expanding conductor pipe and fittings	40
Cast iron piece fittings for wrought iron pipe, black and galv	70
Bushings and plugs	75

Malleable unions	65
" flange unions	72½
Long screw	70
Gas pipe hooks	50
Cast iron flanges, manifolds and expansion pipe hangers	65
Hook, ring and expansion plates, coil stands	67½
Iron body: Globe, angle, check, cross, safety, butterfly, throttle, back pressure and foot valves	65&10
Iron body: Expansion joints and iron cocks, all iron	65&10
Iron body: Iron cocks with brass plugs	60&10
Straight way valves	
Brass: Globe, angle, check, cross safety, and radiator valves	60&10
Tarottle and butterfly valves	5 &10
Brass: Fin. globe valves, with finished brass wheels	40&10
Brass: Steam, service, meter and union meter cocks	57½&10
Brass: Expansion joints and steam bibbs	50&10
Mississippi gauge cocks	55
Bingham "	
Gas proving pumps	50
Oil cups, lubricators and air cocks	60&10
Cocks for steam gauges	60&10
Cylinder cocks	50&10
Comp. gauge cocks	55&10
Water gauges, steam whistles and whistle valves	60&10
Gas fixture fittings	55
McNamara hydrants and street washers	Spec'l
Stop cock boxes	Spec'l
Galvanized wrought iron range boilers, to 52 gallons	65
Galvanized wrought iron range boilers, larger	50
Stands for same	40
Copper bath tubs	25
Closets	Spec'l
Cast iron soil pipe, to 6 in. inclusive	60
" " fittings, to 6 in. inclusive	65
Cast iron sinks	70
" slop sinks	60
Drive-well points	50
Ground key work:	
Rough and fin. plain, tray and bath bibbs " stops, shower stops, hydrant and ball cocks	55&10
Compression:	
Rough and fin. plain, tray and bath bibbs	50&10
" " stops; urinal, hopper, hydrant and ball cocks	50&10
Basin cocks, from No. 1 to 13 inclusive	50&10
" " above No. 13, and double basin	40&10
Shampooing and sink cocks	40&10
Pantry cocks	50&10
Shampooing sprinklers	50&10
Double bath cocks and chain stays	50&10
Hose goods, plain and water back couplings	55&10
Boiler couplings, ground face, per set net, $1.25	10
Boiler couplings plain face, per set net, $1.20	10
Basin plugs and grates; bath, sink and wash tray plugs	60&10
Soldering nipples and unions	65&10
Union joints	60&10
End ferrules; street washer screws, checks and guides	55&10
Hydrant and basin clamps, bydrant sockets	55&10
Pipe taps, reamers and dies	60
Plain pipe tongs and gas plyers	50
Wrenches: Coe	50 & 5
" Girard agricultural	65
" " standard	60 & 5
" Stillson	33½
" Armstrong	25 & 5
" Bemis & Call	25 & 5
" Rouse	30
" Bauer's	10
Pipe tongs: Brown's adjustable	50
" Jarecki	50
" Robbins' chain	10
" Brock's	10
Vises: Plain pipe	55
" Smith comb	50
" Parker's comb	50
" Bauer's pipe and bolt	10
Machinists' hammers	40
Corner "	Spec'l
Pipe cutters: Stanwood	20
" Eureka	45
" Saunders	40
" Barnes	50 & 5
Malleable oilers and hand lamps	Spec'l
Screwing stocks	60
Armstrong's adjustable stocks and dies	25&10
Waste, at manufacturer's prices.	
Gas fitters' cement	Spec'l
Hair felt	Spec'l
Riley Bros. cement	Spec'l
Otley Bros. steam packing	Spec'l
Mineral wool	Spec'l
Lubricating compound	Spec'l
Malleable iron fittings, black and galv	25
Wrought iron couplings and nipples, black and galv	70

Standard Wrought Iron, Steam, Gas and Water Pipe.

Nominal Size Inside Diameter.	Price per Foot, Black	Price per Foot, Galvanized.	Thickness.	Nominal Weight per Foot.	No. of Threads per in. of Screw.	Price, Extra Threads.
In.			In.	Lbs.		
⅛	0 04	0 05	.068	0 24	27	0 05
¼	0 04	0 05	.088	0 42	18	0 05
⅜	0 04	0 05½	.091	0 56	18	0 05
½	0 05	0 07	.109	0 84	14	0 05
¾	0 07	0 09	.113	1 12	14	0 05
1	0 09½	0 12½	.134	1 67	11½	0 06
1¼	0 12½	0 17	.140	2 24	11½	0 07
1½	0 22	0 25	.145	2 68	11½	0 08
2	0 28	0 32	.154	3 61	11½	0 10
2½	0 44	0 49	.204	5 74	8	0 15
3	0 58	0 64	.217	7 54	8	0 20
3½	0 70	0 86	.226	9 00	8	0 25
4	0 85	1 00	.237	10 66	8	0 35
4½	1 00	1 25	.246	12 49	8	0 45
5	1 20	1 50	.259	14 50	8	0 55
6	1 65	2 00	.280	18 76	8	0 70
7	2 00		.301	23 27	8	0 85
8	2 75		.322	28 18	8	1 00
9	3 70		.344	33 70	8	1 20
10	4 75		.366	40 06	8	1 25
11	5 75		.375	45 02	8	1 50
12	6 50		.375	49 00	8	2 50
13	7 75		.375	54 00	8	
14	9 00		.375	58 00	8	
15	10 00		.375	62 40	8	

Extra Strong, double above list.

Double Extra Strong, double list of Extra Strong.

LAP-WELDED BOILER TUBES.

Size, Outside Diameter, inches	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	3¾	4	4½	5	5½	6	6½	7	8	9	10	11	12
Price per foot	23	23	23	25	22	25	28	31	34	38	43	45	52	60	72	1 00	1 45	1 85	2 25	2 75	3 25	3 55		
Price, Lap-Welded Drive Pipe	8	10	12		15		22		30		40		50	60	66	9	1 30	1 65	2 20	3 00	4 50			

DRIVE PIPE SHOES.

	6"	8"	10"	12"
Long, Separate	13 00	15 00	20 10	25 00
" Shrunk on pipe	16 00	18 00	25 00	30 00
Short, Separate	12 00	14 00	17 00	22 00
" Screwed on pipe	13 00	15 00	19 00	24 00

DRIVE PIPE HEADS.

	12 00	15 00	18 00	22 00		

LAP-WELDED CASING.

Size, Inside Diameter Nominal	2	2¼	2½	3	3¼	3½	3¾	4	4½	5	5 3-16	5½	6	6½	7	8	8½	9	9½	10	10½	11	12
Price, per foot	25	28	31	34	38	43	45	52	56	61	66	72	79	86	1 00	1 30	1 45	1 85	2 10	2 25	2 50	2 75	

Tarred or Asphalt and Kalamein Pipe, list and discount furnished on application.

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All sizes and kinds, with and without Axles.

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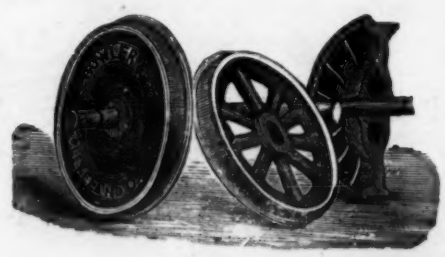

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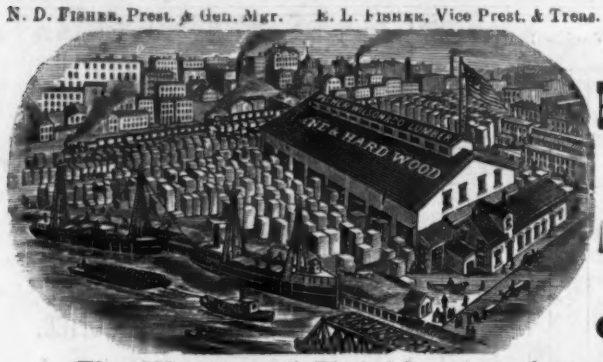

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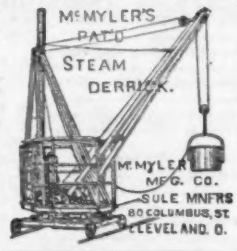

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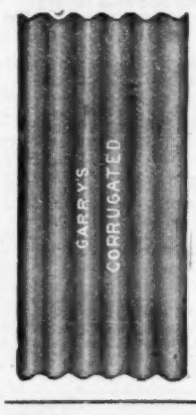

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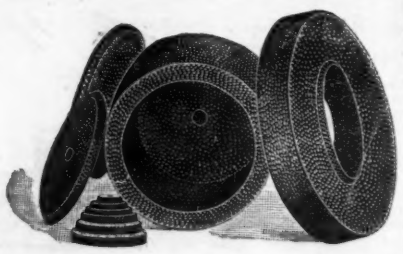

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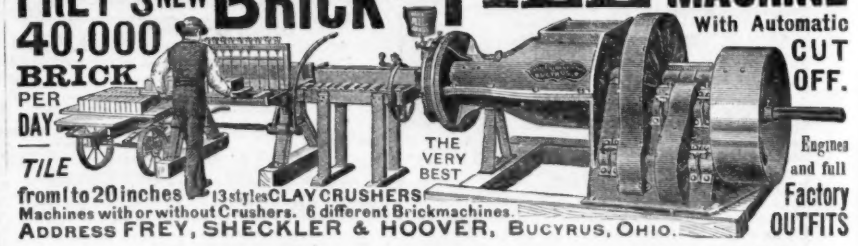

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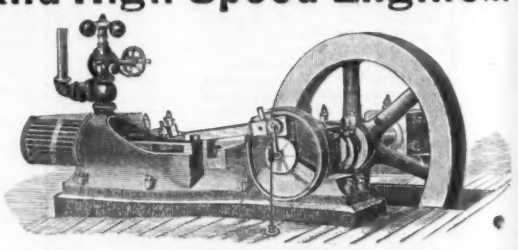

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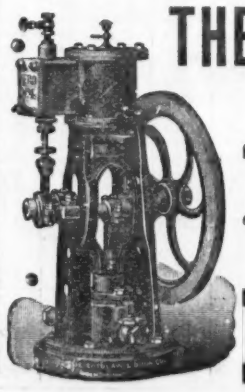

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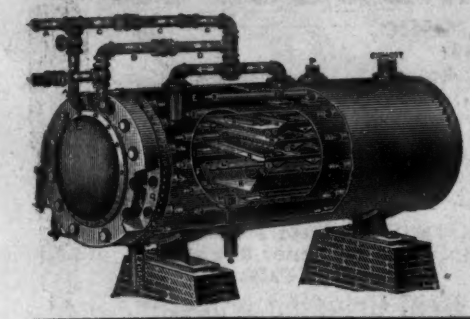

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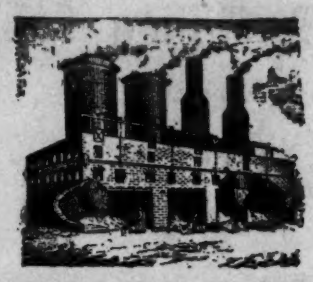

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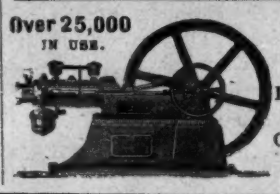

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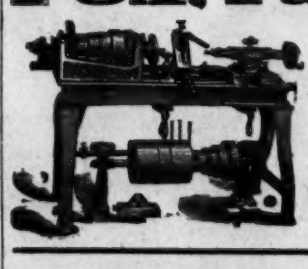

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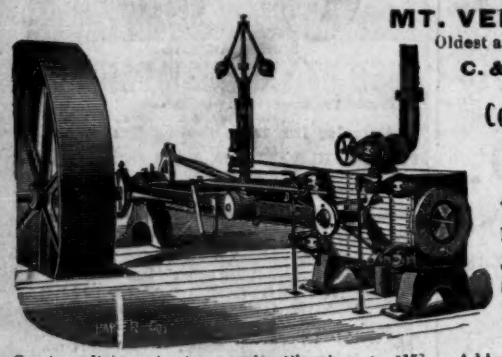

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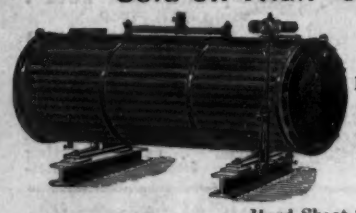

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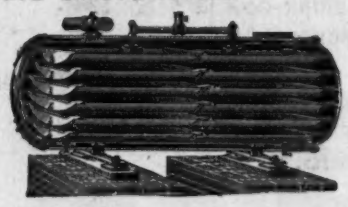

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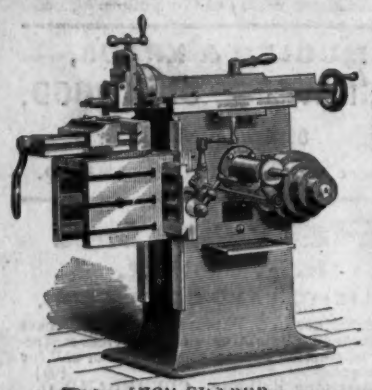

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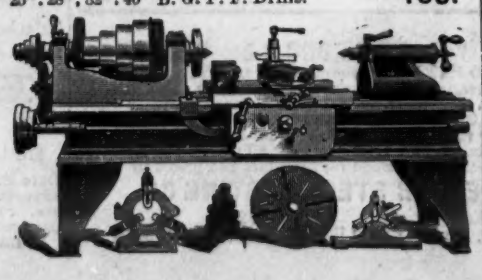

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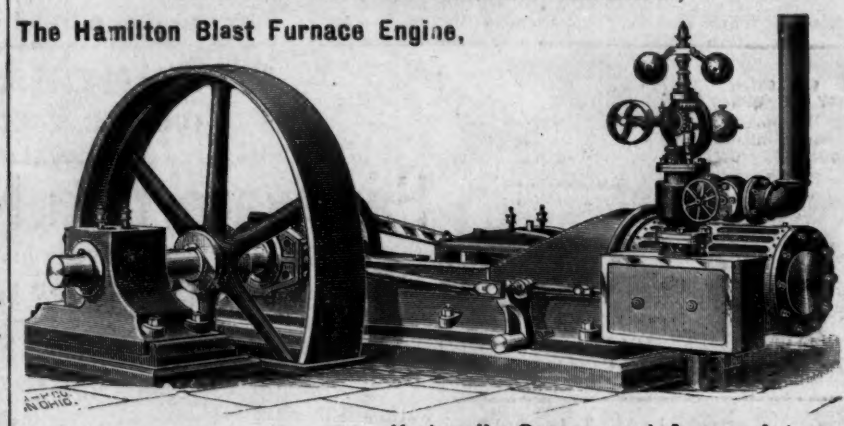

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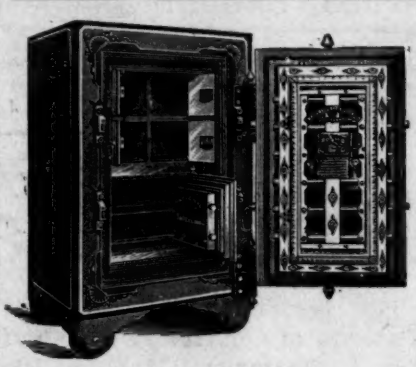

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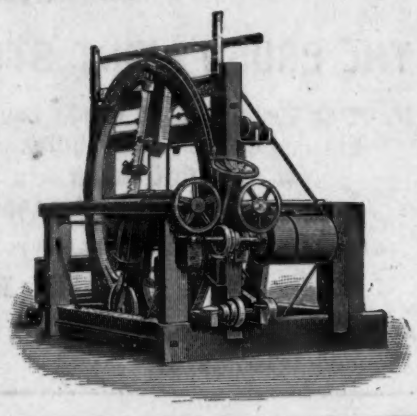

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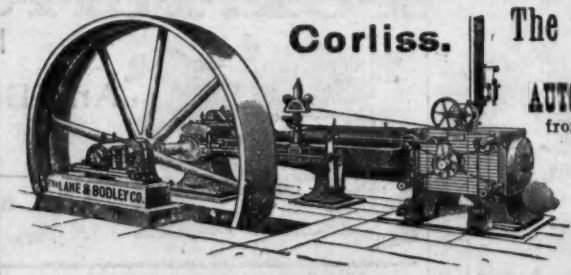

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